SOUTHERN POWER AND INDUSTRY

Ad Index, page 188

MAY, 1952

In This Issue

MAINTENANCE AIDS FOR SOUTHERN PLANTS

(Sixth Annual Maintenance Issue)

Troubles and Cures

18 Short informative articles from men responsible for finding and correcting troubles in industrial and power plants

Procedures and Planning

Scheduling and Records; The Electrician's Job; Modernization Case History; How to Fight Corrosion; Industrial Lubrication Manual

Plant Up-Keep and Repairs

Floors; Cooling Towers; Traveling Screens; Diesel-Electric; Boilers and Superheaters; Refrigeration Equipment; Pumps; Piping; V-Beits

Maintenance Facilities

Vacuum Cleaning: Electric Welding: Rope and Tackle.
Plus a special section listing latest maintenance tools,
devices and supplies

► See Complete Table of Contents......Page 3

Shake-Down
Problems and Solutions
See Page 94



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MAY 1952





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Facts and Trends

FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

May, 1952

THE PLANT MAINTENANCE MAN in Southern and Southwestern industrial and power plants must set up his own program, establish his own procedures to meet his own needs. He can secure a vast amount of help from a great many sources, but interpreting and applying that information is his own job.

Virtually this entire 6th Annual Plant Maintenance Issue of SP&I features ideas, tools, methods and devices "plant tested" in Southern industry. Southern plant maintenance men who have the widest knowledge, because they handle a wide variety of equipment, report on operating troubles, plant housekeeping, plant lubrication, and record keeping. Manufacturers' specialists, best equipped to give exact detail on specific types of equipment, report on rope, cooling towers, pumps, v-belt drives, floors, refrigeration equipment, etc.

This data is supplemented by expanded new equipment and catalog sections on What's New in Maintenance Tools and Supplies — water-proofing compounds, power sweepers, cleaning agents, tools; and How-To-Do-It catalog listings on silicone protective compounds, building maintenance, lighting maintenance, paints, chains, bearing seals and paint systems.

- ➤ YOU CAN ROLL THE POWER, LIGHT AND HEAT to the maintenance job or temporary assembly line with National Electric Products Corporation's NE Rolla-Duct. Collapsible, fully portable device includes a power and light unit, strip of flood lighting, and strip of infrared heating units. Duct strip incorporates a circuit breaker for full worker protection. Units, carrying an approved rating for 20 amp loads for 115 or 120 volt operation, increase service area of permanent electric outlets to a radius of 20 ft or more.
- NEED A PORTABLE HEAT SOURCE to solve last season's cold weather problems? Check Wiegand's Thermwire. Process machinery housings in one plant were wrapped with the flexible heating cable and covered with insulation to prevent condensation from falling into material being processed below. Similar wrap-around installations prevent freezing and keep water and viscous fluids running in pipe lines under belowzero conditions.
- ► HIGH-LEVEL MAINTENANCE AIDS Don't forget the versatile fork truck.

 Maintenance is normally scheduled to avoid conflict with production, so use your truck both as a lifting device and work platform.

 Another aid is Atlas Industrial Corporation's Hi-Lift Telescopic Tower for heights above 30 ft. Electrically operated tower starts as a 6 ft unit and extends to full height in less than 5 minutes.

Donwill's "Industrial Monkey", being distributed by Hyster, is an hydraulically operated telescopic boom with a self-leveling cage. Unit weighs 3,500 lb and can be U-bolted to a two ton truck frame. Boom, with self-leveling working cage, extends over 33 ft. Micarta insulated work platform has eight foot-controlled switches, which are duplicated in truck cab. Quick coupler for air tools or high pressure liquids is located at base of platform.

(Continued on page 6)

KERRIGAN a Great Name in Grating

With the WELD that Never Fails!

Kerrigan grating is a one-piece INSEPARABLE unit. Bearing bars and crossbars are WELDFORGED by Kerrigan's exclusive process into ONE PIECE. Resulting grating is a strong, anti-slip, easy-to-clean grating that affords maximum light and ventilation, a minimum of installation and maintenance expense, and long years of trouble-free use.



for rust resistance and against extra protection paint to corresion Holds finishes.

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engineered . . . and how Kerrigan's Never-Fail Weld stands up under the severest kind of punishment. Just write on your letterhead for free copy.



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- ➤ YOUR SPRAY OPERATORS are spending a large share of the production dollar. With the finish of more than 90 per cent of industrial products being spray-applied, check on possible economies. Materials must be carefully mixed and rigidly controlled. Improper thinner or reducer and the disregard of material temperatures will raise costs. Select "above average workmen" for the job. Have the operator on the line so the product approaches from the left. Train operators on stroking and triggering a spray gun, proper distances, pattern in relation to surface, and dangers of arcing the gun.
- NEW HIGH-FREQUENCY SUPPLY for fluorescent lamps offers interesting industrial possibilities. The G-E designed system, whose fluorescent lamps operate at a frequency of 360 cycles rather than the conventional 60 cycles has been installed at the U.S. Department of Agriculture's Plant Industry Station at Beltsville, Md. Advantages: A reported 40 per cent increase in amount of light available from the lamps and the substitution of tiny capacitors weighing only a few ounces for the large conventional ballasts weighing several pounds.

The Beltsville, Maryland, installation is unusual in that the laboratory room ceiling is literally covered with 8 ft slimline fluorescent lamps. Eighty-eight of them are mounted only one inch apart. Level of illumination is well over 2000 foot-candles, more than 40 times the amount of light in the modern office.

► HIGH COST OF LOW LIGHTING MAINTENANCE STANDARDS is emphasized by Sylvania in a recent fluorescent installation after 5,000 to 6,000 hours of burning. Of all the light from the "poorly maintained" installation, dead lamps took a 14 per cent slice; dirty lamps and reflectors pilfered 27 per cent more; and dark, dingy walls, ceilings and room equipment stole another 11 per cent through light absorption.

You'll gain more light for your money by following Sylvania's recommendations — check lighting levels regularly, replace burnouts promptly, keep lamps and reflectors clean, maintain proper line voltage, keep a stock of fixture parts, and replace lamps system—atically.

Those reflecting surfaces are mighty important. If your walls and ceilings are dark colored, repaint them in a lighter tone. Then keep them clean. Machinery need not be dark colored and dingy. Tradition, mostly, has kept them so. Lighter colors, kept clean, improve room illumination and stretch lighting dollars.

CHECKING THE PERFORMANCE OF YOUR REFRIGERATION EQUIPMENT? An excellent discussion of the fundamentals involved is featured in this 6th Annual Plant Maintenance Issue of SP&I. R. S. Sandifer, Sales Engineer, York Corporation in Houston, Texas, discusses, how to determine tonnage and horsepower, what the findings mean, causes of high horsepower, and how to improve the horsepower per ton of any refrigerating plant.

Mr. Sandifer assumes that the reader understands how to interpret indicated horsepower correctly. Actually, indicated horsepower cannot readily be compared with the electric meter reading, because there are several conversion steps between the two factors. The meter reads kilowatts instead of horsepower; and also, both compressor efficiency and motor efficiency enter into the calculation. By discussing his particular plant with an experienced refrigeration engineer, the plant operator can write down the necessary index figures that will make all future checks very easy indeed.

Write the editors for additional information on any of the above items. SOUTHERN POWER & INDUSTRY 806 Peachtree St., N.E. Atlanta 5, Ga.

The better the valve, the less it will require maintenance

With Powell, it's not "how many but "how good." Powell Valves are so good that they operate most efficiently, last much longer, and require far less maintenance. In short, Powell can give you flow control at its best.

There's a greater variety of Powell valves in use today than of any other individual make.

The Wm. Powell Co. Cincinnati 22, Ohio

SOUTHERN POWER & INDUSTRY for MAY, 1952

NEW MAINTENANCE TOOLS AND SUPPLIES

tools . . . supplies . . . devices for

on-the-job Plant Maintenance

Threading machines . . . drills . . . sweepers . . . scaffolds . . . cleaners . . . protective coatings . . . clamps . . . floor conditioners . . . maintenance paint systems . . . tape . . . leakage compound

Pipe and Bolt Threading

F-I THE RIDGE TOOL COMPANY, Elyria, Ohio, has announced the new Ridgid "500" Pipe and Bolt Threading Machine, a new type of self-contained die head which is said to reduce first cost and save work and time.

The new Quadritype Die Head is instantly adjustable to thread I in. to 2 in. pipe, including over and under size, regardless of position of quick-opening lever and without removing dies or die head from the machine. The new improved Dualtype Die Heads, one for ½ in. and % in., and one for ½ in. and % in. offer this same instant size change right in the machine. Monotype Die Heads, ¼ in. to 2 in., which adjust to over and



All tools in the new Ridgid "500" Pipe and Bolt Threading Machine cut and ream independently and swing up out of the way when not in uso. Motor supplies ample power, even for pipe to 12 in. when geared tools are used, is universal forward-reverse. 115 v, 25-80 cycles, a-c or d-c single phase, light socket power.



New type self-contained die head is instantly adjustable to thread 1 to 2 in. pipe, including over and under size, regardless of position of quickopening lever and without removing dies or die head from machine.

under size in the machine, are also available.

Unit comes in bench and stand models, latter open or closed, with or without wheels.

Work Holding Technique

F-2

CENTINELA INDUSTRIAL
SUPPLY Co., 11930 Inglewood Ave., Hawthorne,
Calif., has introduced the new Saxton
Clamp, which incorporates a new
patented principle in clamping.

The new unit is case hardened and combines features of a standard drop forged "C" clamp and a toolmaker's parallel clamp. By the use of a torque converting ball-bearing trunnion in the new clamp, distorting, twisting action is said to be completely eliminated. The trunnion also absorbs vibration, thus insuring a firm, steady grip throughout milling, routing and

shaping operations. There is no unsupported screw or loose pad to "walk" off the center when pressure is applied against the anvil.



Centinela's Saxton Clamp combines best features of a "C" clamp and a toolmaker's parallel clamp.

Free Reader Service

New equipment and methods that improve maintenance only a little are of big value in overall plant operation.

Additional information on any of these tools, methods, devices, etc., for on-the-job plant maintenance is offered Southern and Southwestern industrial and power plant maintenance personnel.

Simply circle the item code number on the postage free post card on page 17. There is no obligation.

(Continued on page 10)

Before You Buy Blow-off **Valves** ASK THESE **QUESTIONS...**

In a tandem blow-off valve hookup, will both valves stay tight?

With Edward, the valve nearest the boiler is the same design as its mate. Both are "sealing" valves.

Is the packing out of the highest temperature zone?

Edward blow-off valves have only one set of packing, for the stem is the only working part that needs to be packed. Packing is above a condensate cooling chamber, removed from highest line temperatures.

Do the valves have backseats, so C, that packing can be replaced in

With Edward, the answer is "yes".

Can leakage start through bonnet misalignment?

Not with Edward blow-off valves. The Edward one-piece bonnet has no yoke posts to permit distortion.

ASA pressure classes 300, 600, 900-1500, 2500 lb. Sizes 1½", 2" 2½"—straightway or angle flanged or socket welding ends—Stellite or Evalloy trim. Are parts of both blow-off valves interchangeable? Edward onswers "yes". And with fewer working parts Edward blow-off valves need less maintenance. If part replacement is

EDWARD BLOW-OFF VALVES

Design simplicity . . . operating ease, law maintence cost . . . stay tight, no trick constructio

necessary, repairs are easier and loss expensive with Edward.

Q. Can the seat and disk bind together?

Not Edward, because the disk lifts off the seat on operating instead of grinding against it. There is no sleeve to gall against the seat.

Edward Valves, Inc.

Subsidiary of ROCKWELL MANUFACTURING COMPANY EAST CHICAGO, INDIANA

122 West 144th Street

Another (1)



Edward built the first steel blow-off valves. Installation records in Amer-Ica's major steam plants for nearly 50 years tell this story—no blow-off valves are better designed for year-in, year-out service with low mainte-nance. Write for Edward blow-off

New Maintenance Tools and Supplies (continued)

Portable Circuit Extensions

F-3

NATIONAL ELECTRIC PRODUCTS CORP., Pittsburgh 19, Pa., has announced the new NE Rolla-Duct series of portable branch circuit extensions which may be carried on public utility service trucks, and include a power and light unit, a strip of flood lighting and a strip of infra-red heating units.

With National Electric Products Corporation's Rolla-Duct, you can literally roll power, light, or heat to any location in industrial maintenance work.

Engineered for electrical safety, the strips are grounded and provided with a circuit breaker incorporated in the strip for full worker protection. The portable assembly consists of a 3 ft 10 in. strip of No. 1700 Surfaceduct, swivel-mounted on allsteel tubular carriage. Wheels are made of special materials that are non-conductive, and which resist chemicals, moisture and oil.

Industrial Work Clothing

F-4 UNION CARBIDE AND CARBON
CORPORATION, 30 East 42nd
St., New York 17, N. Y., is
producing dynel, a new textile fiber
for industrial uniforms and other
work clothing, particularly for use in
chemical and petroleum plants.

The material can withstand splash-

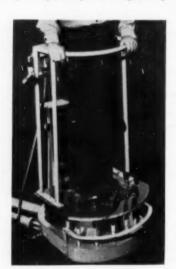
ing by most acids and alkalis without harm. It has exceptionally long laundry life, is unaffected by harsh soaps and detergents commonly used to clean industrial garments, is stain resistant, and can be disinfected in strong bleaches with no effect on fabric strength. Virtually shrinkproof, it dries quickly, requires no ironing, and can be worn again in a few hours. Dynel can be woven into fabrics suitable for hot or cold weather.

Highwork Equipment

F-5

DONWILL COMPANY, 835
S.E. Main St., Portland
Oregon, is distributing their
highwork equipment through the
Mobilift Fork Lift Truck sales and
service branches. Southern and Southwestern branch offices of Mobilift Corporation are located in Atlanta,
Georgia, and Dallas, Texas.

The Industrial Monkey consists of a hydraulically operated telescoping boom with a self-leveling cage that takes a workman directly to the spot. Boom has a 270-degree turning radius and a horizontal-to-vertical working span. Operator positions cage at any



Close-up of self-leveling cage, showing insulated Micarta work platform. Platform is mounted on heavy duty insulators giving workman protection from more than 24,000 volts. Eight insulated foot-controlled switches are signal, left swing, out, in, down, up, right swing and emergency engine stop. Quick coupler for air tools or high pressure liquids is located at base of platform.



Here a Model M Industrial Monkey of the Donwill Company, with a 33 ft is in vertical height, ground-to-floor platform, has a workman at a safe, convenient position to splice connector lines at a newly constructed sub-

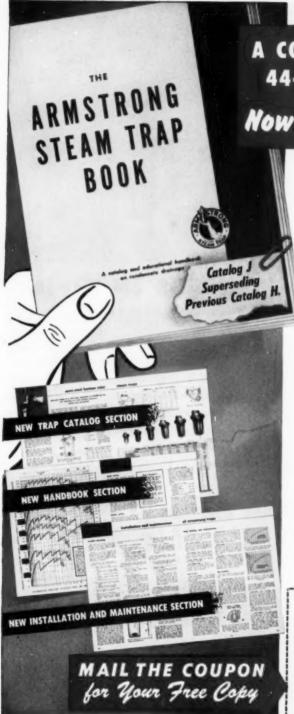
desired spot through use of six insulated foot controls.

Boom and cage will carry a 200-lb man at any angle from the horizontal to the vertical with a safety factor of more than 4 to 1. Boom and cage is self-locking in case the engine stops. Unit can be mounted on any two-ton or heavier truck with 102 in. from rear of cab to center line of rear axle. Boom and cage retracts into a compact traveling position with clearance of 10 ft 6 in.

Industrial Monkey, weighing 3,500 lb, ready to be U-bolted to truck frame consists of: base with mounting rails, turntable, boom and insulated cage, pump, oil, hydraulic actuating cylinders, controls, and dual controls for truck cab.

Applications: pole and line work, light installation and maintenance painting, equipment servicing, heavy construction and oil field work.

> (Check page 142 for More Maintenance Aids)



A COMPLETELY NEW 44-PAGE EDITION Now off the Press!

An Authoritative Guide to Good Trapping Practice

THE new Armstrong Steam Trap Book (Catalog J) is a practical working manual for any man concerned with the efficient operation of steam equipment through the correct selection, installation or maintenance of steam traps.

New Trap Catalog Section — complete data on Armstrong cast semi-steel and forged steel inverted bucket traps, compound traps and ball float traps, including: list prices, dimensions, capacities, service pressure ratings and materials.

New Handbook Section — tells how to select the right size trap for nearly every type and size of equipment; including steam mains, purifiers, separators, unit heaters, jacketed kettles, retorts, hot water heaters, coils and syphon drained cylinders; explains how to use the new Armstrong trap capacity chart; explains and gives recommended safety factors; includes reference tables and charts on such subjects as warming-up and radiation loads, condensing rates, recommended trap sizes, Armstrong trap EDR ratings, effect of scale on submerged coil condensing rates.

New Installation and Maintenance Section — covers trap hookups, use of check valves, preventive maintenance schedules, troubleshooting, many practical suggestions and answers to common problems.

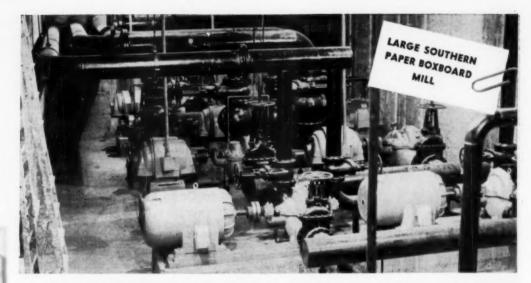
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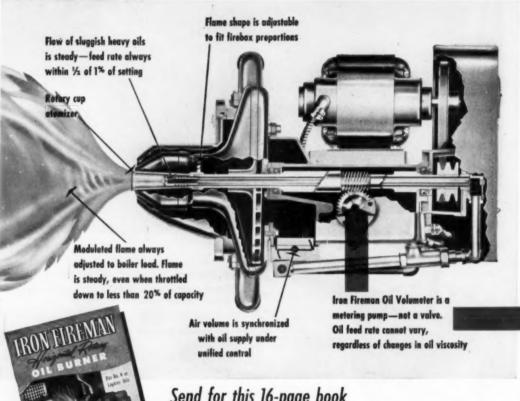
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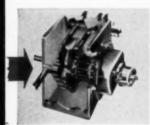
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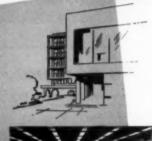
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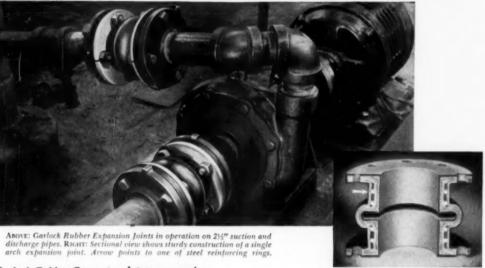


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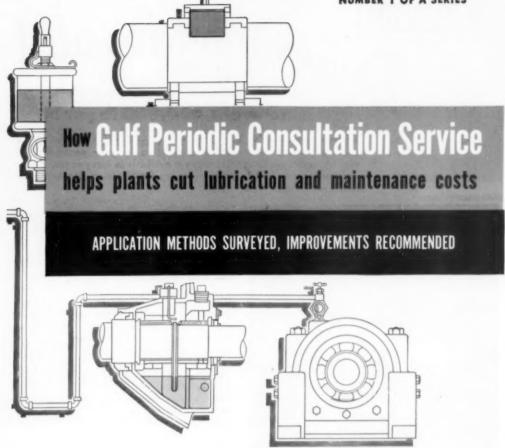
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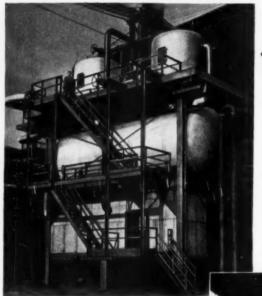


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For the large capacity plant

Graver Deaerating Heaters are serving high-pressure high-temperature central power stations and large industrial plants all over the country. Even with difficult operating conditions such as variable load and corrosive water, Graver installations uniformly exceed guarantees and operate with complete satisfaction, minimum attention, and negligible maintenance expense.

for the small capacity plant

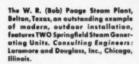
Standard designs of Graver small
Deaerating Heaters are specially
engineered for the same low-oxygen
guarantee carried by the larger and
more expensive Graver Heaters. These
small Graver units provide complete
deaeration at a low cost that is
quickly returned by savings in plant
operation, maintenance and
outage costs.

Investigate Graver Deperator corrosion protection for your plant. Specific recommendations are offered without obligation. Write for your copy of "Trends in Application of Deperating Heaters for Treatment of Boiler Feedwater".

GRAVER WATER CONDITIONING CO.

Division of Graver Tank & Mfg. Co., Inc.
Dept. SPI-H. 216 WEST 14th STREET, NEW YORK 11, N. Y.

GW-462



Right:—A view on the operating floor showing firing arrangement of Springfield Steam Generators.

Below: - The design cross-section.

... a story of multiple sales

SPRINGFIELD Steam Generating Units combine modern design and efficiency with low initial and operating costs. That is why Springfield Boiler Co. enjoys so many repeat orders. For example, less than two years after the initial installation, this duplicate unit was added to the W. R. (Bob) Poage Steam Plant at Belton, Texas, to provide additional economical, trouble-free capacity.

Springfield specializes in the design and production of modern, efficient steam generating equipment—TAILORED TO SPECIFIC NEEDS—of size—pressure—temperature—and fuel. For economy, for ease of operation, for long, trouble-free service, write Springfield Boiler Co. today.

DESIGN DATA

1997 L Capital Ave. Sprendeld Heals V.S.

Porton Syrregard, Hinell, V. S.

NI TURN CORDES & STRANGOTT THUS BOREITS + KATHERICATES + DESCRIPTION - 2.27

WRITE FOR LITERATURE ON DESIGN AND INSTALLATIONS

Labor



with 854 sixes of ... stock bearings for all applications in machine tools and industrial machinery.

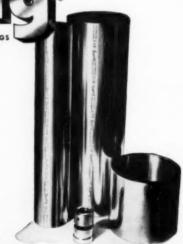
with 324 sixes of ... replacement bearings for all popular sizes and makes of electric motors.

with 263 sixes of ... completely machined tubular and solid bronze

Hundreds of different sizes of Bunting Bronze bearings and bars make it easy to select a size that fits the job.

N STOCK EVERYWHERE

Bunting products are instantly available in all markets, from the stocks of leading industrial distributors and distributors of specialized industrial items. Ask your distributor or write for catalog.



THE BUNTING BRASS & BRONZE COMPANY . TOLEDO 7, OHIO . BRANCHES IN PRINCIPAL CITIES

NO WEAK POWER LINKS

with **DURASHEATH**

ALL-PURPOSE DURASHEATH* can be used for every type of power and lighting application. In combined duct, aerial and direct-burial use, Durasheath effectively resists electrolysis, condensation, weathering, sunlight, organic decay, abrasion, and mechanical injury.

DURASHEATH COSTS LESS to install . . . because it is flexible, easy to handle, light in weight. It may be run in one continuous length without expensive splicing. It costs less to maintain . . . because its tough neoprene jacket can take terrific punishment in any use. It costs less to stock . . . because, instead of three cables, one — versatile Durasheath — meets every electrical distribution requirement.

SPECIFY DURASHEATH for economy, reliability, and durability. See your nearest Anaconda Sales Office or Distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

the right cable for the job

ANACONDA' wire and cable

for traffic control, airport† power and lighting, mines, industrial plants, railroads, street lighting, and many other uses.

available in all sizes-from large to small-single and multi-conductor.

*Trademark ticken undered to CAA Specification L #21.





PROB

From Western Precipitation-the organization that pioneered the

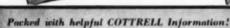
commercial application of Cottrell Precipitation...

If YOU ARE ENGAGED in any phase of industry where the recovery of dusts, fumes, fly ash, mists, fogs or other suspensions from gases is a problem, you will find this booklet on the COTTRELL Electrical Precipitator helpful and informative.

Western Precipitation pioneered and installed the first commercial application of the well-known COTTRELL Electric Precipitator—Dr. Cottrell, the inventor, being a member of the company. And for more than 42 years Western Precipitation has consistently led in developing new COTTRELL advancements and techniques for recovering suspensions from gases, both wet and dry.

This 28 page booklet summarizes many of the basic facts you should know about modern COTTRELL Precipitators—the various types available, how they operate, principal types of electrode systems and rectifiers, shell constructions, etc. As long as the supply lasts, a free copy will be sent you on request to our nearest office. Ask for Bulletin No. C 103.

28 PAGES
of holpful facts to
know obout
COTTRELL
ELECTRICAL
PRECIPITATORS



a This Western Precipitation Cottrell booklet is designed to answer questions of design engineers, plant engineers and others interested in applying Precipitators to the recovery of industrial dusts and mists. It discusses such subjects as . . .

- Busic types of Cottroll Electric Precipitators.
- Principal parts of a Cottroll Precipitator.
- Machanical and Electronic Rectifiers.
- Various types of Collecting Electrodes (rad curtains, corrugated plates, dual plates, packet alectrodes, etc.).
- · Ramaval of Collected Material.
- · Fusture in Shell Construction (steel, concrete, brick, etc.).
- Operating Efficiencies and the Effect of Various Factors on Performance.

... and many other basic Cottrell facts. Write for your se capy of Bulletin C103 today while supplies are adequate!



Western Precipitation is not affiliated with any other company

United States or other countries

field of electrical precipitation except its wholly owned subsidiaties, international Precipitation Corporation and the Precipitation Company of Canada, Ltd. Whether you are now contemplating the installation of

a Cottrell Electrical Precipitator, or may be interested in such an installation at a future date, we can and will serve you in any part of the

Major Offices: 1052 WEST NINTH STREET, LOS ANGELES 15, CALFORNAS CHRYSLEE BLDG., NEW YORK 17 * 1 LOSALLE ST. BLDG., 1 N. Lo SALLE ST. CHICAGO 2 * HOBART BUILDING, SAN FRANCISCO 4, CALIFORNIA PRECENTATION CO. OF CANADA, LTD. DOMINION SQ. BLDG., MONTREAL



... in all parts of the U.S.A. and foreign countries.

It's the HUMAN ELEMENT



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makes
the
DIFFERENCE
in
SOUTHERN
NATURAL
SERVICE

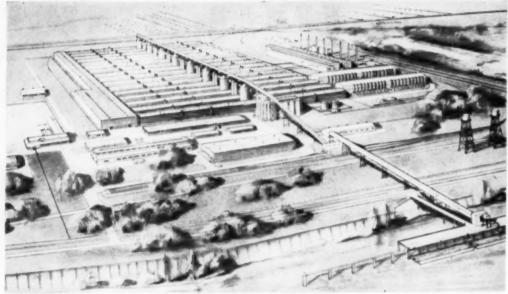
Key factor in Southern Natural Gas Company's round-the-clock service is the *human* element.

Not that modern machinery and techniques aren't important too. For the very best in equipment keeps natural gas surging through Southern Natural's 2835 miles of big steel pipe.

But most of all we are proud of Southern Natural's people. Their specialized skills and their willingness to put out that extra effort have helped make their company one of the leaders in the pipe line industry.



Watts Building, Birmingham, Alabama



KAISER ALUMINUM AND CHEMICAL CORPORATION'S new 400,000,000 pound-a-year, \$150,000,000 aluminum reduction plant at Chalmette, La., designed and built by Kaiser Engineers, is the largest plant of its kind in the U.S. The plant—where production began in December,

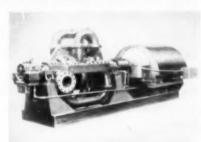
1951—uses 19 Worthington boiler-feed pumps and other Worthington equipment including thirty 9,300 square-foot condensers, and fifteen 250,000 pound-per-hour deaerators, 2 steam turbines and numerous circulating

Power plant at largest aluminum reduction plant to use Worthington pumps, condensers, deaerators

It takes plenty of electric power to produce 400,000,000 pounds of aluminum in a year. And that's what they're doing at the new Kaiser Aluminum plant at Chalmette, La.—largest aluminum reduction plant in the U. S.

Kaiser joins many other top companies in choosing Worthington boiler-feed pumps as well as other key equipment for their new plant. Such choices arise out of an insistence for equipment that's engineered for maximum performance.

Worthington engineering produces boiler-feed pumps of the most advanced design in the field, made from specially selected metals. Each pump is exactly right for the pressure and temperature with which it is to perform. Over 110 years of Worthington experience in building pumping equipment go into making this a certainty. Worthington Corporation, formerly Worthington Pump & Machinery Corporation, Centrifugal Pump Division, Harrison, New Jersey.



19 WORTHINGTON 250,000 LBS PER HR BOILER-FEED PUMPS at new Kaiser plant, handle feedwater at 257 F against a discharge pressure of 1,030 psig. Pumps are axial-balanced, volute type centrifugals. Two, similar to one illustrated, are driven by Worthington 450-hp steam turbines.



For Boiler Feed Service. Capacities to 1,500 GPM Heads to 1,000 feet



For Hotwell, Condensate, Chilled Water Service. Capacities to 1,400 GPM, Heads to 650



For Water Works, Circulation, Drainage, General Service, Capneties to 135,000 GPM: Heads to 400



For Boiler Feed Service, Capacities to 3,000 GPM. Heads to 7,000 feet

The World's Broadest Line Assures You the Right Pump for Every Job

WORTHINGTON

Centrifugal Pumps



You've only won half the battle when your dust collecting system has captured the "devil's snow"... The final cost of cleanliness in your plant area depends on the efficiency of your disposal system. Here are two A-S-H developments that will give you better housekeeping at lower cost:

Automatic Sequence Head

A single pushbutton controls the entire dust handling system. Dust is sequentially removed from the hoppers, and the air is loaded with just the right amount of dust for maximum efficiency.



Automatic Dust Conditioner

Designed for plants using trucks or railroad cars for disposal, this new machine positively prevents accidental escape of dust in unloading, and gives an ideal mixture of dust and water for handling and transport.

Ask your nearest A-S-H engineer how these pioneering developments can help you solve your dust problem.

THE ALLEN-SHERMAN-HOFF CO.

Dept. L -- 259 E. Lancaster Ave., Wynnewood, Pa.

Offices and Representatives in Principal Cities

HYDROJET HYDROVAC

materials handling systems

ARRELL-CHEEK crane wheels can be supplied to suit your exact requirements. Controlled heat treat, a completely modern plant, selected alloys, and thorough research by our staff of engineers, produces wheels which give service from four to eight times greater than ordinary

Wherever wheels receive day-in day-out heavy use such as on overhead or gantry cranes, charging machines, ingot buggies, skip hoists, or on transfer and kiln cars . . . Farrell-Cheek provides the best wheel for the purpose, and best with Farrell-Cheek means minimum wear, long life, and thoroughly satisfied users.

Farrell-Cheek wheels are made to be highly resistant to hock loads and to abrasive wear. They have earned their fine reputation by giving maximum, trouble free service on the job. All wearing surfaces are carefully hardened of the finest of pressure cast steels. Endurance, reedom from frequent change over, economy and safety are all inherent in any Farrell-Cheek wheel.

Parrell-Cheek's one-point service is truly complete. Either tandard or special designs can be furnished. Our engineering department will gladly design according to your needs and specifications. Farrell-Cheek Steel Comany has earned a fine reputation for its ability to provide the best product for your use.

WE WOULD BE HAPPY TO SERVE YOU

SKIP, INGOT CAR, GANTRY, MONORAIL, CHARGING MACHINE

F-"85" is a special purpose cast steel which can be heat treated through selective proc-Treads and flanges essing. are toughened and hardened for maximum resistance to shock and abrasive wear.

Farrell's Hard Edge cast steels produce wheels in which treads and flanges are processed and treated through a depth of from $\frac{1}{8}$ " to 5/16", according to the size of the wheel. This extremely tough, hardened surface is backed with alloy steels having a Brinell rating of from 285 to 315. All Farrell wheels are supplied with either straight, tapered, or radiused



FARRELL'S CARBON FARRELL'S HARD EDGE STEEL CASTINGS STEEL CASTINGS

BAHROAD CASTINGS Locomotive and Car R. R. Specialty Castings ELEVATOR, CONVEYOR PARTS Sprockets, Traction Wheels, Chains, Buckets, Rollers, Idlers.

Carbon and Allay Steels "True Tooth" Geers and Machined, Hordened, Ground, Pinions, Skeaves and Wheels. CRANE WHEELS

Overhead, Gantry, Menorall, Ingot Car, Charging Machine.

STOKER PARTS Flooged Pipe, etc. HEAVY HARDWARE

SPECIALIZED CASTINGS

YOUR INQUIRY WILL PROMPTLY BRING DETAILED INFORMATION PERTAINING TO ANY OF THE ABOVE FARRELL-CHEEK PRODUCTS SANDUSKY, OHIO U.S.A.

QUALITY CLEAR THROE



American AC-6 Coal Crusher

> Copacity: 300 tons per hr. ROM to 3/4"

American Crusher quality is being constantly reaffirmed by case histories coming in from power plants, central stations and mines throughout the country ... records which are proving beyond a doubt American's superlative performance and economy of operation. Here, for example, are the

Cost Surveys of 29 American Installations

Average Age of Crushers

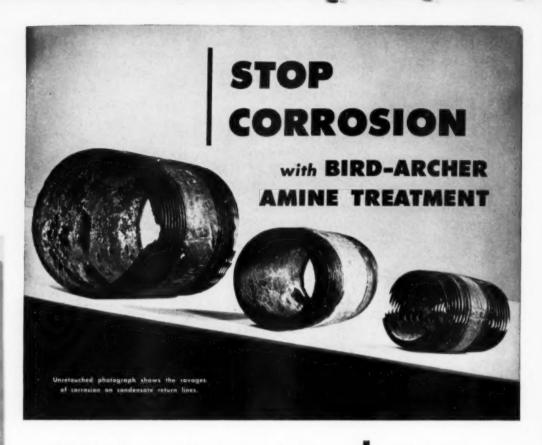
THERE CAN BE NO BETTER PROOF OF QUALITY!

Hmerican-

PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1243 MACKLIND AVE., ST. LOUIS 10, MO.



Corrosion of piping in steam and condensate return lines is an expensive two-way headache. (1) It leads to large outlays for pipe replacement and maintenance. (2) It often results in plugged return lines and traps due to the solid products of corrosion. Bird-Archer Amine Treatment effectively eliminates these troubles at low cost.

Here's how. Amines are fed into the boiler or into the steam and condensate systems. The amines raise the pH value of the condensate and also tend to inhibit equipment-destroying corrosion through surface protection of the metal itself. In scores of plants, this Bird-Archer system has more than paid for itself by substantially cutting replacement and maintenance costs.

Bulletin CP 100 gives all the facts on Bird-Archer Amine Treatment. Write for your copy.





BIRD-ARCHER

WATER TREATMENT

THE BIRD-ARCHER COMPANY, 4337 NORTH AMERICAN ST., PHILADELPHIA 40, PA.
NEW YORK • CHICAGO

IN CANADA: The Bird-Archer Co., Limited, Cohourg, Ontario In Mexico: Calderas y Accesorios, S.A., Amsterdam 291, Mexico, D.F.

84 10

"Here's why I keep a stock of Kaocast on hand!"



The Chief Engineer of a mid-western power plant finds B&W Kaocast so versatile that he always keeps a ton or more on hand for miscellaneous jobs. This is only one of hundreds of plants in a list of diversified industries which are discovering practical, time-and-money-saving uses for this unique 3000 degree refractory castable. The panel at right gives a few examples.

There are good reasons for these Kaocast "success stories". This jack-of-all-refractories can be molded in a hurry by you, when you need it. It can be cast directly in place or applied by cement gun. Kaocast not only makes possible faster repairs and eliminates the need for a large inventory of special shapes, but it also stays on the job. That's because Kaocast has high resistance to spalling and slag attack, low volume change and negligible re-heat shrinkage.

Get all the data on easy-to-use, versatile Kaocast from your B&W Field Engineer. His specialized experience is an important B&W "extra".

KAOCAST is another important refractories development by B&W engineers who have continuously established new standards in industrial furnace refractories for the past 30 years.



BURNER BLOCKS

Kaocast lasted 3 to 6 times as long as previous refractory. Still going strong.



DOOR LININGS

Kaocast lasted 3 to 6 times as long as previous refractory—cut installation cost in half.



TUNNEL KILN CAR TOPS

Ordinary fireclay crumbled after few trips. Kaocast lasted 30 trips without deterioration.



SPECIAL SHAPES

Kaocast special shapes cast over weekend to meet production demands.





B&W REFRACTORIES PRODUCTS — B&W Allmul Firebrick * B&W 80 Firebrick * B&W Junior Firebrick * B&W Insulating Firebrick B&W Refractory Castables, Plastics and Morters * OTHER B&W PRODUCTS—Stationary & Marine Boilers and Component Equipment . . . Chemical Recovery Units . . . Seamless & Welded Tubes . . . Pulverizers . . . Fuel Burning Equipment . . . Pressure Vessels . . . Alloy Castings



THE first step in preserving steel with paint is apply-THE first step in preserving seed in job is to prevent ing the prime coat. Its primary job is to prevent and kill rust action. TNEMEC Primers do just that, by creating a neutral condition on steel surfaces, changing active rust and corrosive agents into an inactive

The second step is applying the finish coat that neutral compound. will provide protection against the specific exposure hazards involved.

WHAT IS YOUR EXPOSURE HAZARD?

Is it the humid, salt-air atmosphere of coastal areas? Is it the acid-laden atmosphere found in and around industrial plants, refineries, steel mills, the processing industries, etc? Is it submersion in sewage treating vats, in salt brine, or in fresh water tanks?

No matter what your problem is, there is a TNEMEC Finish Coat to solve it. And remember . . . you will always save many maintenance dollars by doing the job right.

Ask Any TNEMEC User



THIS COUPON FOR YOUR COPY OF TNEMEC CATALOG 50

TNEMEC COMPANY, INC.

131 W. 23rd Ave., North Konses City, Missouri

Send my copy of your Catalog 50 to: Gentlemen:

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ADDRESS

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From the small

POWER PLANTS



to the BIF DISTES



if its coal Handling Anywhere Specify Continental

BELT CONVEYORS & BUCKET ELEVATORS & SCREW CONVEYORS

APRON CONVEYORS & FEEDERS & ACCESSORIES

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CONTINENTAL GIN COMPANY

BIRMINGHAM, ALABAMA

ENGINEERS

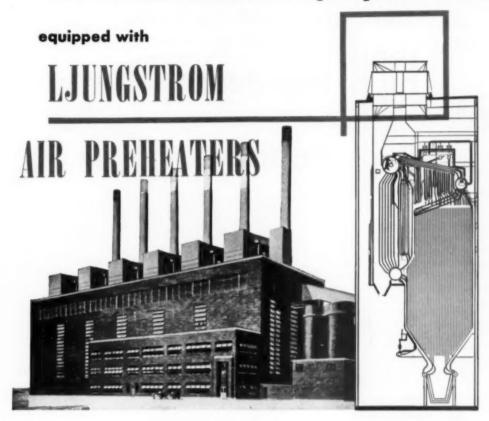


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MANUEACTUREDS

Three Boilers at Noblesville Station of the Public Service Company of Indiana



Public Service Company of Indiana, in its postwar expansion program, has added hundreds of thousands of kilowatts for the increasing needs of rural and industrial midwest.

The latest new station to go on the line is Noblesville Station, designed by Sargent & Lundy, Chicago, to add 90,000 KW to this utility's power output. Noblesville utilizes three Riley Steam Generating Units. Each unit is pulverized coal fired, with a capacity of 300,000 lb of steam per hr at 1025 psi and 950 F.

Each Riley unit is supplied with a Ljungstrom Air Preheater, which preheats combustion air to 650 F, cools exit gas to 288 F before it enters the stack.

The unanimity with which Ljungstrom Air Preheaters are chosen for high efficiency steam generating units like these is the best evidence of their high thermal efficiency and dependability. Every boiler manufacturer has included Ljungstrom Air Preheaters in outstanding installations made during the past few years.

THE Air Preheater Corporation

60 E. 42nd St., New York 17, N. Y.

Walworth's NEW small cast steel valves

SERIES 1500 - SIZES 4 to 2 inches

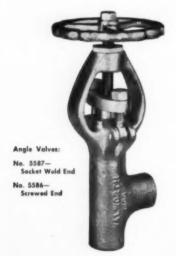
handle

HIGH HIGH

pressures

Y-Globe Valves:
No. 5585—Socket Weld Ends
No. 5584—Screwed Ends

Walworth is proud to make these new Small Cast Steel Valves available to power stations . . . oil refineries . . . ships . . . wherever piping is subject to severe pressures and temperatures. Non-shock service ratings of these valves: 1500 psi-950F for steam; 3600 psi-100F for water, oil or gas. Cast of chromium molybdenum steel, they are compact and light, yet exceptionally strong. Both Y-Globe and Angle type valves are available.



Simplified Walworth design eliminates many of the valve problems encountered in high pressure service. Among the features of this new valve are:

INTEGRAL BODY AND YOKE — made from a single casting without threading or welding. Bonnet joint — always a potential source of leakage — is eliminated. Valves can be reassembled quickly and easily.

ROTATING DISC — prevents valve seat distortion and consequent leakage. Cuts down replacements.

WELDED SEAT RING — compensates for changes in pressure and temper-

ature—eliminates a major source of leakage.

SPECIAL BACK SEAT BUSHING – permits repacking the valve under

pressure with greater safety.

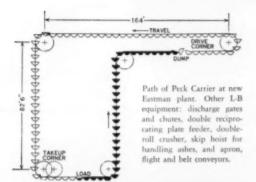
PACKING CHAMBER — designed to dissipate heat thus keeping packing rings at lower temperatures—gives them longer life.

These valves are available with either socket weld ends or screwed ends, in sizes ranging from 1/4 to 2 inches. For further information on Walworth series 1500 Small Cast Steel Valves, see your local Walworth distributor, or write for Circular No. 134.

WALWORTH

valves • fittings • pipe wrenches 60 EAST 42nd STREET, NEW YORK 17, N. Y.

Eastman repeats after 22 years ... orders another Peck Carrier!





Upper horizontal run of Peck Carrier serves new coal bunkers. Use of L-B Electrofluid Drive cuts motor size from 30 to 20 hp.

Proof that LINK-BELT's unified responsibility cuts power plant coal handling costs

When Eastman Kodak Co. enlarged their Rochester (N.Y.) power plant recently, they again called in Link-Belt. They wanted the same efficient coal handling they are getting in their 1929-built plant, to assure uninterrupted supply of process steam 24 hours a day.

The new system—also built around a Link-Belt Peck Carrier—handles 130 tons of coal per hour. Because the Peck Carrier moves coal vertically as well as horizontally, without transfer points, all costs are extremely low—initial, operating and maintenance.

Eastman's versatile carrier can be emptied over a belt conveyor by a stationary tripper to serve the old steam plant. Or, with a movable tripper, coal can be discharged, at any point on the upper run to fill the new bunkers uniformly.

Remember, too, Link-Belt designs and builds complete coal handling systems for large or small plants. One source . . . one responsibility. Ask your Link-Belt representative for a copy of new Power Plant Book 2410.



LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 35, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities.

12,774



Note full loading of buckets being automatically discharged by tripper. Buckets stay horizontal in any travel direction.

Check the three big reasons why it pays to specify Eagle-Picher Insulation:

1. 2.



Eagle-Picher "66" Insulating Cement-

All-purpose, rust-inhibitive, superadhesive insulating cement. Great coverage, extreme thermal efficiency with "Springy Ball" pellets which won't collapse after application. Easy trowel application over all kinds of surfaces. Efficient up to 1800 F... reclaimable where temperatures do not exceed 1200 F.



THE EAGLE-PICHER

Cost-cutting insulations of top thermal efficiency



Insulating Cements



Fireproofing Cements



Supertemp Block



Blankets



Insulseal



Stalastic



Dependable contractors, trained to strict factory standards

You can count on Eagle-Picher authorized contractors for uniformly high caliber service. Their qualifications provide assurance of a good job every time . . . efficient application of the Eagle-Picher insulation that best fits your needs.



Fast delivery from strategically located distribution points

The Eagle-Picher insulation line is stocked by distributors and authorized contractors coast to coast. The one nearest you will be happy to recommend insulating materials that give your equipment highest thermal efficiency . . . reduce fuel costs . . . help provide precise temperature control.

Eagle-Picher Supertemp Blocks—

A real insulating block—not a refractory! Unequalled for insulating quality. Weighs approximately 16 lbs. per cu. ft. Cuts easily with knife or saw... fits snugly over contoured surfaces. Monolithic structure... high refractory value. Withstands temperatures up to 1700 F. All standard sizes, from 3" x 18" to 12" x 36"... in thicknesses from 1" to 4".



Engle-Picher Mineral Wool Blankets—

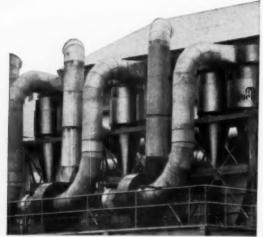
Made under factory supervision, these blankets fill your needs for fast, convenient insulating of flat or curved surfaces on larger types of heated equipment. The wool is felted and secured by flexible metal fabric . . . possesses outstanding physical and chemical stability for maximum resistance to water, steam, corrosive fumes and vibration.





General offices: Cincinnati (1), Ohio

Insulation products of efficient mineral wool—for a full range of high and low temperatures. Technical data on request.



Buell Cyclones installed in series to collect nuisance dust at a steel plant. High efficiency operation is assured by exclusive 'Shave-off' feature.

Worrying About Fly-Ash Discharge?



This industrial 'dust' man can help determine the Dust Abatement System most efficient for you!

The Buell organization of industrial 'dust' men is devoted solely to the design and construction of dust collection equipment that will most efficiently and economically solve your plant's specific Stack Dust problem.

For more than 18 years we have been doing just this for all American industry. Every Buell installation is a custom-designed system, engineered to hold stack dust discharge down to the practical limits which assure improved product and/or process, better plant-community relations, higher levels of employee morale.

For full information about Buell's **3 basic systems** of dust collection, and how one can be applied to the solution of your stack dust problems, write today. Ask for the new informative bulletin titled, "The Collection and Recovery of Industrial Dusts." Do it now. Buell Engineering Co., Dept. 80-E, 70 Pine Street, New York 5, N. Y.





MIGH EFFICIENCY CYCLONES * ELECTRIC PRECIPITATORS
TYPE 'LR' COLLECTORS * LOW DRAFT LOSS COLLECTORS
SPECIAL PURPOSE COLLECTORS * DUST NOPPER VALVES

ENGINEERED EFFICIENCY IN DUST COLLECTION



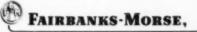
DUAL FUEL POWER SAVING OVER \$19,000 A YEAR!

In the western Kansas city of Colby, Fairbanks-Morse Dua! Fuel Engine economy has been making savings in fuel and lube oil that amount to over \$19,000 annually!

But impressive as it is, that isn't the whole story. For this Model 33 Engine has been the mainstay of the plant—operating more than 96% of the time... generating more than 83% of the plant's total load.

Fairbanks-Morse Dual Fuel Engines are ideal for all generating service. They can produce savings even when operating under unfavorable load factors. Fairbanks, Morse & Co., Chicago 5, Illinois.

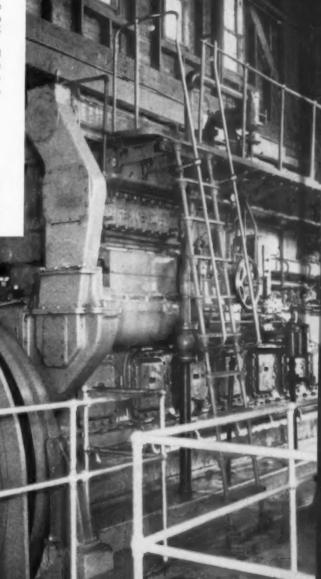
Put Your Power Costs In Order With Fairbanks-Morse Dual Fuel Economies



a name worth remembering

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • ELEC-TRICAL MACHINERY • PUMPS • SCALES • NOME WATER SERVICE EQUIPMENT • RAIL CARS • FARM MACHINERY • MAGNETOS

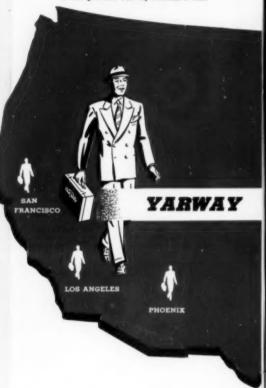
all the state of t



blow-down lines at all pressures in more than 15,000 boiler plants from coast-to-coast are kept tight by YARWAY



Type B Seatless Tandem Valve combining two angle valves. Iron body for pressures to 250 psi. Steel body for pressures to 400 psi. See Yarway Bulletin B-425.





Blow-Off Valves

Home Office: 116 Mermaid Ave., Philadelphia 18, Pa.

Southern Representative: ROGER A. MARTIN, Bons Allen Building, Atlants 3, Ga.



Hard Seat Blow-Off Valve (angle) coneseat and disc type, with mated stellite seat and disc. Made for pressures up to 2500 psi, flanged or welding ends. See Bulletin B-433.





OPA / FOR ACCURACY... AND YOU'LL ALWAYS BUY AMERICAN DIAL THERMOMETERS

Consistent accuracy - long-life service - have been associated with American Dial Thermometers for one hundred years! Every one is backed by the engineering skill and knowledge of materials, manufacturing and applications gained in more than a century of service to industry.

American Dial Thermometers are made in ranges from minus 60° to plus 1000°F. Selection is easy because we produce the greatest variety and offer the widest range of actuation in the dial thermometer business.

Mercury Actuation for rapid response, powerful action, extreme accuracy.

Vapor Pressure Actuation for accurate indication of temperatures at the most critical operating points.

Gas Actuation for extremely high or extremely low temperature indications.

Bi-Metal Actuation for easy, fast, and economical installation.

Easy Readability - provided with clear, bold numerals, accurately graduated dials, and pointer of contrasting color.

Rugged Construction - stainless steel movements, climate-resistant cases, heavy cover glass fronts, unique flush mounting flanges.

New Catalog contains full details about the complete American line, including industrial glass, dial and recording thermometers: electronic temperature indicators and recorders. Write for a copy.















Pictured here are some of the many American Dial Thermometers stocked and sold by leading distributors.







A product of MANNING, MAXWELL & MOORE, INC. STRATFORD, CONNECTICUT MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'HANCOCK' VALVES, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES. BUILDERS OF "SHAW-BOX" CRANES, "BUDGIT" AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

We Make ALL Types of PLUG VALVES

ONE OF THEM IS THE RIGHT VALVE FOR YOUR NEEDS

HOMESTEAD-REISER "Self-Seald" LUBRICATED PLUG VALVES



Worm & Goar Operated

Outside step limits plug travel to 90°. Pressure-segled head prevents leakage around top of valve.

Full threaded lubricant crew prevents dirt from being worked into valve.

Port position indicator.

Stainless thrust shim elimnates gasket wear.

Straight line fluid flow. Streamlined ports.

100% port seal; lubricont fully surrounds valve ports.

Self - Seald - Wedge action of divided plug gives extra tight seal against leakage.



Non-Jubricated

HOMESTEAD CAM-SEALD

(dry seat)

Automatic adjustment for internal wear extends life of valve.

Swaling surfaces protected from corrosive or



HOMESTEAD LEVER-SEALD

(quarter turn)



Flunged or Screw Ends

How the Amazing "Self-Seald" Principle Works

erosive line fluids.

Homestead-Reiser's patented "Self-Seald" principle is, we believe, the simplest and most effective sealing principle yet developed for lubricated plug valves.

In addition to a full lubricant seal around the ports, and around the top and bottom of the valve, the wedgeaction of the divided plug under line pressure, causes the finely-finished surfaces of both segments of the plug to press outward against the sealing surfaces of the body.

This self-sealing action keeps the plug surfaces in contact with the mirror-like bore of the body. The plug automatically adjusts itself for wear, thus assuring extra long life and maximum leakless service.

For complete information, sizes and prices, write for Catalog 39-5. No obligation.



Flanged or Screw Ends









Screw Ends

HOMESTEAD VALVE MANUFACTURING COMPANY "Serving Since 1892" CORAOPOLIS, PA. P. O. BOX 70

Meeting a tight

New York's largest

STEAM GENERALOR

a 1,450,000 lb per hr FOSTER WHEELER



New York is perennially "bursting at the seams"—but there is always a way to accommodate additional development. This is made possible by wise city planning and the far-sighted policy of the Consolidated Edison Company of New York, Inc. which keeps ahead of New York's ever-growing demand for electricity.

The new Foster Wheeler Steam Generator now being constructed for the East River Station of the Consolidated Edison Company is a contemporary example of how one organization seeks to anticipate the needs of future populations.

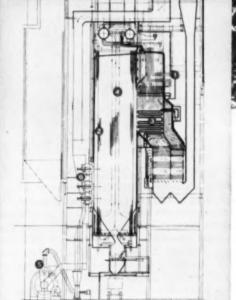
FOSTER WHEELER CORPORATION . 145



New FW Steam Generator for the East River Station of the Consolidated Edison Company of New York, Inc.

Maximum Capability 1,430,000 lb per for
Pressure Superheater Outlet 1850 paig
Primary Steam Temperature 1000 #
Superheat Control Range 325,000 to
1,430,000 lb per for
Reheat Steam Temperature 1000 #

Dual Circulation REHEAT Unit



- STEAM OF SUPER PURITY—Application of dual circulation principle produces steam of lowest contamination especially silica.
- RADIANT SUPERHEATER—in combination with convection superheater enables attainment of full primary steam temperature from 25% to full load.
- CONVECTION REHEATER—Location in low temperature zone after convection superheater provides protection against all variables in operation.
- CONSERVATIVE FURNACE—Low heat absorption rates per unit area and low furnace exit gas temperatures.
- FOSTER WHEELER BALL MILLS High availability, low maintenance and sustained fineness of pulverization.
- FOSTER WHEELER TURBULENT BURNERS—Turbulent action of air and fuel produces uniform mixture for complete combustion and even heat distribution.

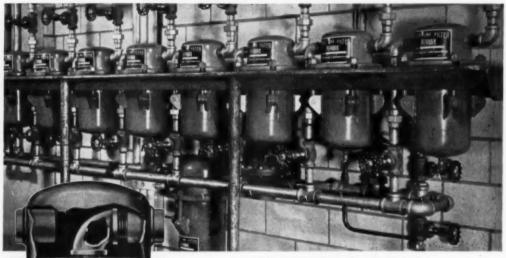
BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER

SOUTHERN POWER & INDUSTRY for MAY, 1952

STAYNEW ABSORPTION FILTERS

Protect Automatic Combustion Controls from All Oil, Moisture, Solids



Specially developed Staynew Filters guarantee clean, dry oir for Boiler Controls at Rochester Gas & Electric Corp.

The Rochester Gas & Electric's new automatic boiler controls needed clean air for efficient operation—air that's free of oil and moisture as well as solids. In order to accomplish this, coke and then charcoal filters were tried. An accumulation of oil continued to "gum up" the reducing valve feeding the master control. Our engineers were called in, and after thorough study, a special felt pad filter (shown at left) was developed and the new filters were installed. Result—no fouling has occurred in the control air system since the filters were installed in 1949.

If you have a special filtration problem call on Dollinger's experienced engineers. Write today for Bulletin B-1A.

Representatives in Principal Cities



DOLLINGER
CORPORATION
40 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

NEW CRANE

SMALL STEEL VALVES

WITH REVOLUTIONARY LIP-SEAL

BONNET JOINT

1500 AND 2500-POUND CLASSES

CHANGE THE STATE OF THE STATE O

Look closely at the Lip-Seal Bonnet joint of this new Crane small steel valve. A small bead of weld metal seals the joint against leakage—yet the entire mechanical load, both pressure and stem thrust, is carried by strong threaded members.

Here is bonnet joint improvement that brings you important benefits beyond tight sealing and freedom from maintenance.

For example, Crane Lip-Seal design permits a weightsaving, more compact structure without sacrificing strength or reducing seat area. It combines significant developments for improved flow control, ease of operation, and durability. Add to these the ease with which the Lip-Seal joint may be dismantled and re-assembled —and you have a valve with outstanding suitability for your high-pressure/high-temperatur, power service needs.

DESIGNED AND TESTED TO GIVE YOU:

- Absolute Tightness
- Freedom From Bonnet Joint Maintenance
- · Minimum Weight and Bulk
- Easier Dismantling and Re-Assembly

Simplified dismantling and Re-Assembly The Lip-Seal joint is dismantled by removing the small seal weld on the lips, and unscrewing. The lips are shaped and positioned to simplify removal by grinding. They're entirely accessible; no pockets or corners to clean out. Rewelding is equally simplified. Crane Lip-Seal Bonnet Valves for 1500 and 2500-Pound Working Pressures. In Globe and Angle patterns; Socket-welding or Screwed Ends. Sizes; by to 2-inch. Choice of Steel as required for service conditions.

This Circular Ready For You

Your copy of this 8-page booklet supplied free on request. Gives complete information on Lip-Scal Valves, including materials, service recommendations, sizes, and dimensions. Ask your Crane Representative for a copy or write direct.

YOU GET FEATURES LIKE THESE IN LIP-SEAL VALVES

SWIVEL DISC-STEM CONNECTION — Minimizes vibration provides long pilot guiding for disc. Design makes a more rigid—yet swivel-free—connection.

FULLY GUIDED STEM—Smoother, easier to operate. Fully guided by long yoke bushing and long engagement with lower end of bonnet. Gives positive, straight-line seating.

TWO-PIECE BALL-TYPE PACKING GLAND—Assures uniform load on packing. Prevents binding on stem even when nuts are not pulled up equally.

BURABLE PLUG-TYPE DISC—Has wide seating contact not easily damaged by foreign matter or by wiredrawing. Taper of disc permits close flow regulation while throttling.

STELLITE-FACED SEATING SURFACES—Effectively withstand corrosion and erosion; highly resistant to wear, seizure, galling, and abrasion. Seat is integral with body.

EASY ACCESS TO STUFFING BOX—Ample space within yoke legs allows convenient re-packing. The swinging type gland eye-bolts swing completely clear.

The Complete Crane Line Meets All Valve Needs. That's Why,
More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Illinois Branches and Wholesalers Serving All Industrial Areas

VALVES . FITTINGS . PIPE . PLUMBING . HEATING



find out what these dependable units can save in your plant

Pictured above is one of the three Conseco Condenser and Ejector units installed in the power plant of the Oklahoma Agricultural & Mechanical College, Stillwater, Okla.

Each of these units, consisting of a two-pass, non-divided flow 2000 sq. ft. Conseco Condenser and a two-stage twin element Conseco Steam Jet Air Ejector, serves a 1500 kw. turbine. College engineers stamped them "OK" for dependable, money-saving teamwork.

This Oklahoma Aggie installation typifies Conseco's ability to meet modern power plant requirements. Conseco Engineers are specialists in heat exchanger equipment and their experience, together with Conseco production facilities, are available to assist you in securing worth-while savings in power production.

WRITE today for helpful engineering bulletins on Conseco Condensers and other equipment for power and processing plants





PRODUCTS INCLUDE: BOILERS . CLOSED HEATERS DEAERATORS . EVAPORATORS . STEAM JET EJECTORS

LADISH

Controlled Quality

PIPE FITTINGS

reduce piping assembly time

Makeup goes smoother...with less chance for delay...on those piping systems where Ladish fittings are installed. Ladish Controlled Quality makes the difference. By exacting controls over materials and manufacturing processes... Controlled Quality assures uniform weldability through metallurgical integrity, fast assembly through dimensional accuracy and provides a real assurance of ultimate operating economy and complete dependability...reasons why it pays to specify LADISH.





For the tough, cumbersome jobs of all sizes that come up regularly in maintenance work, you need the flexible capacity, and the tremendous power and stamina of the Nebel extension bed gap lathes. They're surprisingly low in price, traditionally dependable in performance.

Send today for information on the 28"/50" 'G' Series (shown above), or the 20"/40" 'AG' Series. Nebel lathes also made in engine and removable block gap models.

THE NEBEL MACHINE TOOL CO., CINCINNATI 25, 0810, U.S.A. builders of fine lathes at modest cost since 1899

for profitable NEBEL REMOVABLE BLOCK GAP ATTHES IS TO OF SWING MAINTENANCE







| THE | NEBEL | MACHINE | TOOL | CO. | | 3400 | CENTRAL | PARKWAY | CINCINNATI | 25, | OHIC |
|-----|-------|---------|------|-----|----|----------|---------|-------------|------------|-----|------|
| | | | | | 42 | 2 . 22 . | At | 12 1 21 - 2 | | | |

write Today for descriptive bulletins Extension bed gap lathes, size _____ Removable black gap lathes, size ____

ADDRESS.

HIGH QUALITY COOKING OILS PRODUCED WITH



STERLING SPEED-TROL!

Speed-Trol on the bran feeder for our oil extractor mill meets our requirements for infinite speed adjustment and accurate, positive speed regulation which are essential to continuous high quality production of our vegetable and cooking oil products. Operating 16 hours per day, 10 months per year, Speed-Trol has also given trouble-free service since its installation three years ago, reports E. E. Rumery, Plant Superintendent, American Rice Growers Cooperative Association, Houston.

STERLING SPEED-TROL GIVES YOU VARIABLE SPEED CONTROL NECESSARY FOR:

EQUIPMENT ADAPTATION TO: Sequence synchronization—operators' abilities—load variations due to differences in quantity, quality, weight, size, tension, hardness or shape of material to be processed, machined, conveyed, blended, mixed, etc.

PROCESS CONTROL OF: Temperature—viscosity—level—pressure—flow—etc.

TIME CONTROL OF: Baking—drying—heating—cooking—pasteurizing—soaking—chemical action—etc.

With Speed-Trol you get the maximum in production, plant efficiency, quality and profit.

OTHER STERLING ELECTRIC POWER DRIVES:

• STERLING SLO-SPEED (GEARED) MOTORS

• STERLING KLOSD AND KLOSD-TITE (NORMAL SPEED) MOTORS

DRIP-PROOF • SPLASH-PROOF • TOTALLY ENCLOSED

70 ILLUSTRATIONS showing how Sterling Electric Power Drives reduce production costs. Write for Bulletin No. B 117.

OUTSTANDING FEATURES:

Infinite speeds—positive speed regulation—fingertip control—large indicator—positive pulleys—no springs—belt tension in proportion to load—protected—streamlined—Herringbone Rotor—through ventilation—versatile mounting—NEMA dimensions—shock absorbing—quiet operation—rugged—compact—dependable—long life,

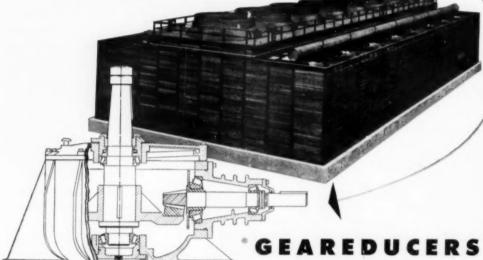


MOTORS

Plants: New York City 51; Van Wert, Ohio; Los Angeles 22; Hamilton, Canada; Santiago, Chile.

Offices and distributors in all principal cities.

It's TOPS... With MARLEY!



designed specifically for cooling tower fans

Geareducers are designed and built by Marley to do just one job—drive fans up to 264 inches in diameter—and do it better than any other mechanism. Years of research and field service prove Geareducer design provides everything needed to resist thrust set up by huge fans. This includes oversize taper roller bearings; hardened alloy steel gears of scientifically selected ratio; pumpless, continuous splash lubrication, super-strong shafts and cases.

Every detail of the design has a specific purpose: consider the wide-spread

Every detail of the design has a specific purpose: consider the wide-spread feet for great stability and the magnetic drain plug that retains any loose particles of metal that might cause wear.

In production all machine processes are constantly inspected with exacting care. When completed, every Geareducer is run in, disassembled, carefully checked part by part, completely coated with moisture resistant grease, and reassembled for shipment.

Producers of DOUBLE FLOW TOWERS DRICGOLERS AQUATOWERS NATURAL DRAFT TOWERS SPRAY NOZZLES VAIRFLO TOWERS DOUBLE FLOW AQUATOWERS DOUBLE FLOW AQUATOWERS



The Marley Company, Inc.

Kansas City 5, Missouri

Why move work around to get to present exhaust ducting?



Take SPIRATUBE to the job!



With SPIRATUBE — the new type flexible ducting — you can set up production lines where you want them without expensive changes in your dust or fume removal system. SPIRATUBE connects quickly, easily to your present lines — and bends anywhere with minimum crimping. No turn is too short, no angle too acute. No elbows or special fittings to bother with in going around obstructions.

Best of all, YOU CAN INSTALL SPIRATUBE YOURSELF! That cuts down-time, keeps your production line going. The initial cost of Spiratube is small . . . and its life equals — sometimes exceeds — rigid ducts.

Standard sizes for all requirements are immediately available from well-stocked distributors — coast-to-coast!

For all ducting systems:

FLEXFLYTE 8

SPIRATUBE

AYRTUBE®



Guilford, Connecticu

Pasadena 1. California

FREE! Full details on this amazing, costsaving ducting. Fill in coupon and mail

FLEXIBLE TUBING CORPORATION, Dept. SPI-1, Guilford, Conn.

Please send me your new catalog on Flexible Tubing products.

My application is.

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State

SOUTHERN POWER & INDUSTRY for MAY, 1952

57

VULCAN Automatic Sequential

for PALATKA STATION of FLORIDA POWER and LIGHT COMPANY



Effective boiler cleaning at low cost was demanded for the new Palatka Steam-Electric Station of Florida Power & Light Company. Vulcan will deliver these benefits. Effective boiler cleaning will be a simple matter of pushing one button. Each blower will then work in correct sequence, applying the right amount of steam at the velocity needed. Steam will be saved, because each blower will operate for exactly the correct time. Labor will be saved, because operators will not need to climb to remote locations. Maintenance costs will be low, because each Vulcan unit is designed and built for easy inspection and repair or replacement. Write for Bulletin 483 Automatic Sequential Soot Blowing.

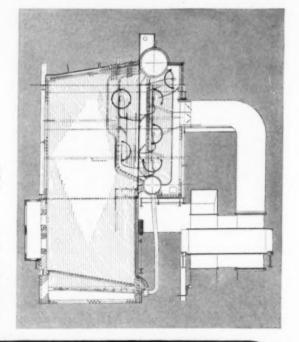
VULCAN SOOT BLOWER DIVISION

CONTINENTAL FOUNDRY & MACHINE COMPANY

DU BOIS, PENNSYLVANIA

Pushing one button at the control panel starts the automatic sequence. Each blower signals that it cuts in and operates correctly. Operation of individual blowers can be skipped or repeated without leaving the panel.

| Beiler byCombustion Engineering-Superheater, Inc. |
|--|
| Type of BoilerVUX |
| Capacity |
| Operating Pressure850 psi |
| Total Steam Temperature900 F |
| Fired withOil; provision for future use of coal |
| Consulting Engineers Ebasco Services, Incorporated |



VULCAN Automatic BLOWERS



How G.E. washes away lamp troubles with Elgin Ultra-Deionized water

As A development of General Electric's constant research to manufacture better and better fluorescent lamps, a significant finding was the need for absolutely pure water... in processes designed to make the best in fluorescent lamps.

To prevent imperfections which could impair efficiency and shorten lamp life, it was found that water must be equal to the best distilled water.

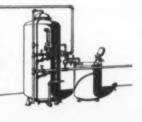
Distilled water might have served, but its cost would be prohibitive. So G-E Lamp Research looked for water of equal quality at justifiable cost... and found the answer in Elgin Ultra-Deionized water. In fact they found a water that for this purpose is better than distilled water. Where other high quality waters were not quite good enough, Elgin Ultra-Deionized water met the requirement remarkably well . . . and at a fraction of the cost of disstilled water.

So here you have another striking example of a difficult water problem solved by Elgin. The same experience and knowledge that solved it is ready to give you the answer to your problem . . . from simplest to most complex. Write for bulletins or let an Elgin engineer work with you.

ELGIN SOFTENER CORPORATION . 132 M. GROVE AVE., ELGIN, ILL.



This Elgin Ultro-Deionizer, new used in G-E lamp plants, produce water free from the most minute trace of mineral impurities. Of compact, single-tank design, it produces water for exceeding the quality of that produced by multiple-tank equipment.



Simplicity, long life, easy maintenance

CAPACITIES TO 1000 GPM PRESSURES TO 1200 PSI TEMPERATURES TO 250-400F

- 1 Opposed impellers balance axial thrust.
- Impeller mounting provides look-proof shaft sealing between stages.
- 3 Exposed shaft insures freedom from
- Removable stuffing boxes permit flexibility in shaft sealing arrangement.
- (5) Split sleave radial bearings are siand-
- Positive interstage wearing ring seals eliminate leakage.
- Casing support insures coupling align



You get them all with...

DE LAVAL

Look at the seven outstanding features shown in the cross-section and you'll see why De Laval Boiler Feed Pumps stay on the job for years...trim maintenance

costs. Suitable materials are available for all water conditions. Write today for bulletin giving full application and specification data.



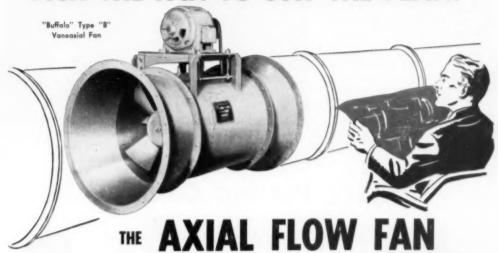
Boiler Feed Pumps

DE LAVAL STEAM TURBINE COMPANY Trenton 2, New Jersey



Tips on Getting the Best Service from your Fans

PICK THE FAN TO SUIT THE PLAN!



Forms a Straight Duct Suction

For ventilating and Air Conditioning service, where your piping will be straight, this Axial Flow Fan is ideal. Fitting in as a section of pipe, it requires little more cubic space than does the pipe. "Buffalo" Fans like the Type "B" Vaneaxial above, are also relatively light, which reduces installation cost. Also, this type of fan is unusually efficient in these straight duct runs. Another advantage in "Buffalo" Axial Flows is their limit-load characteristic—you cannot overload them, regardless of system pressure.



For Performance Curve and other useful information on "Buffalo" Axial Flow Fans, write today for Engineering Bulletin 3533-C.



like this "Buffalo" Limit-Load Fan, forms a built-in 90-deg. elbow. If your system is to have many curved connections, consider this type of fan. Details are in Bulletin 3737. Write for your copy.

FOR FANS

BUFFALO FORGE COMPANY

530 BROADWAY

BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK
Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

VENTILATING AIR CLEANING AIR TEN

AIR TEMPERING

INDUCED DRAFT

EXHAUSTING

VENTILATING FORCED DRAFT

COOLING

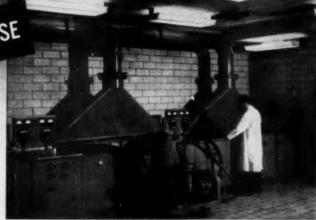
HEATING

PRESSURE BLOWING

WESTINGHOUSE

Our illustration shows a corner of the extensive pilot plating plant at Westinghouse's East Pittsburgh laboratories, where many improved plating processes have been developed and tested.

For example, this line of 100 gallon tanks was used to perfect the company's P.R.* process of plating to secure brighter finishes by periodic reversal of the plating current.



Five Sarco Type LSI indicating electric controls actuating solenoid valves to maintain any desired constant plating temperature on 100 gallon tanks of PR process pilot line at East Pittsburgh.

SARCO PLATING CONTROLS



Sarco Plating Controls were selected as a result of several years' experience in Westinghouse plants in Pittsburgh and elsewhere.

You can buy them with confidence. Low first cost, high accuracy, long life with minimum maintenance cost are outstanding features. Write for our Bulletins and the name of the Sarco man nearest you. His experience may include the solution to some of your control problems.



New: Sarcostat hydro-electric motor valve for use with LSI thermostats in place of solenoid valves. Powerful, direct thrust no pilots or levers, slow opening and closing. Bulletin 1081.

Sarco Type LSI indicating electric temperature control for all kinds of plating. Long or short temperature ranges custom made as needed. Bulletin 1026.

*For full information on this process see the article in the May 1st, 1950, issue of "Steel".

337

SARCO SAVES STEAM

SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y. SARCO CANADA, LTD., TORONTO 8, ONTARIO

IMPROVES PRODUCT QUALITY AND OUTPUT

Hays Guide **Boiler Plant Results**

increased efficiency

"Operating efficiency has been as high as 82%-much of the credit going to the accuracy of (Hays) automatically controlled combustion."

> SHERWIN WILLIAMS. Chicago Plant



low maintenance

"we find that due to the (Hays) properly controlled combustion, our maintenance on both stokers and boilers has been considerably decreased."

AMERICAN TOBACCO COMPANY



fuel savings

"we estimated that . . . we would be able to pay for the new equipment (Havs Combustion Control) out of the fuel savings in three years. Since then, the records show that the amortization of the original investment has been accelerated."

RAYBESTOS-MANHATTAN, INC.



rapid response to wide load swings

"we have made test runs using the Hays system, bringing the load rapidly up from 8,000 to 80,000 lbs per hour with excellent results. Fuel-air ratio was held at the desired value and CO2 at 15%."

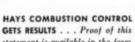
BEMIS BROTHERS BAG CO.

Automotic Combustion Control

Veriflow Meters and Veritral

Gas Analyzers · Draft Gages

Boiler Panels . Hays-Penn Flawmeters



statement is available in the form of case histories on the boiler plant experience of 9 leading companies. These "result stories" cover small, medium, and large boilers -burning all types of fuel, including alternate fuels-with different load characteristics-and different uses for steam.

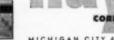
Send us a brief statement of your specific conditions and specifications. You'll receive the case histories which fit your needs and a 48 page booklet on "Boiler Plant Instrumentation".











MICHIGAN CITY 4. INDIANA

Large Power Producer Meets Demands up to 400,000 lb per hour with **Evaporation Rate of 12.8**

"During the many years we have been generating power at Scovill Manufacturing Company, Waterbury, Conn., says Leo Niekerk, Power Plant Chief Engineer, "we have evolved a general philosophy for power plant operation: buy the best equipment available, then operate and maintain it in the most intelligent way possible. We have two power houses-the West Power House containing one 500 kw vertical turbine, one 3,000 kw condensing turbine generator, and two 600 hp oil-fired 150 psi boilers on standby; and the East Power House containing three 3500 kw condensing turbines, one 5,000 kw topping turbine, six 600 hp stoker-fired 250 psi boilers and, handling most of the load, two 660 psi oil or pulverized coal-fired steam generating units rated at 225,000 lb/hr and 150,000 lb/hr."

fuel handling

"Coal from railroad cars is transferred to overhead bunkers by a conveyor system. Fly ash from dust collectors is removed by conveyor ash handling system and discharged through an outside silo. Oil is stored in two 150,000 gal. tanks and fed by gravity to the fuel oil pumps in the basement."

combustion control

"When we installed our Boiler #1 in 1940 we selected Hays Combustion Control. We were so pleased with its operation during the next six years that when we installed Boiler #2 in 1946 we again specified Hays Combustion Control. Each boiler has its own Hays panel containing a complete complement of modern boiler room instruments and controls. Currently we are meeting steam demands up to 400,000 lb per hour (with load swings as high as 60,000 to 70,000 lb per hour) while achieving an evaporation rate of 12.8, a fuel cost per kw of \$.0049, and a cost per thousand pounds of steam of \$.706. No small part of the credit for the versatility and efficiency of our operations should go to the Hays Combustion Control System. Maintenance expense on the control system has been negligible.

The above story is a condensation of a completely illustrated case history on the power plant operation of Scovill Manufacturing Company. Write for Bulletin R-8, available free from The Hays Corporation, Michigan City, Ind.



Any extra stress more than meets its match in the extra strength of the stem and wedge-gate connection. Added life for seat rings and gate faces is obtained by using super-hardened stainless steel. Seizing or galling of seating surfaces is prevented by gates (with certain types of trim) super-hardened by Chapman's Malcomizing process to at least 800 Brinell.

You can get List 960 in sizes from ½ to 2", and equipped with rising stem—either with yoke as shown above, or with inside screw. Bonnet joints are gasketed or metal-to-metal. Pressure range: 2,000 lb. at 100°F.—380 lb. at 1,000°F. For higher pressures, specify List 990. Catalog No. 10 is yours for the asking. Write to The Chapman Valve Manufacturing Company, Indian Orchard, Mass.

The CHAPMAN VALVE

Manufacturing Company INDIAN ORCHARD, MASSACHUSETTS

Timely Comments



Skull Practice Will Cut Maintenance Costs

MOST INDUSTRIAL MAINTENANCE JOBS fit naturally into one of three divisions — (1) permanent repairs, (2) routine up-keep, and (3) temporary procedures. Thorough consideration of these three different types of repairs is of real help in developing adequate inspection, scheduling and planning procedures.

Permanent Repairs—where initially faulty or inadequate parts are replaced in an improved manner, so that the failure should not recur—at least for a long time.

These are usually attributable to improper design or faulty parts or materials. In some instances the failure is sudden and completely unexpected—even in spite of good regular inspection. All schedules must be sufficiently flexible to permit handling a reasonable number of such failures without any great disturbance in the organization.

Routine Up-keep—the lion's share of work in the well designed, well organized plant. These are the parts and devices that normally wear and need attention in accord with a more or less regular schedule. Here, inspection, scheduling, and planning can be so thorough that the work is handled on a smooth, regular basis and at minimum cost.

Not all deterioration is as definite as that of the 1000-hour incandescent light, but by and large careful records of experience will give remarkably accurate indication of the time such replacements and repairs are necessary.

Temporary Procedures—emergency expedients that are known to be inadequate, but are necessary because of operating schedules, or unavailability of materials and parts for correct repairs. Here, advance study pays greatest dividends in reduced costs.

The master mechanic must quickly secure answers to a number of questions before deciding on details of a temporary repair—What is the money cost of production downtime caused by the failure? . . . How long would it take to get materials and make a proper repair? . . . How good will it be? . . . How much will it cost? . . . How will the total overall cost of two repairs compare with delay and expense of taking time to do it right the first time?

Skull Practice Will Pay Off

The coach never knows in advance what the opposing team is going to do when the day of the game arrives. He prepares for the worst. "If they do this, we'll do that. If they do so and so, how will we counter it?"

Use these tactics in fighting plant maintenance costs. Generally, if all possibilities are considered in advance, definite answers are available through careful study. The major objective is to reduce the number of temporary repairs by devising means whereby permanent repairs can be made, when and if the emergency occurs.

How about taking care of part of these emergencies in advance? The electrician knows that certain "jumpers" would be needed to by-pass certain equipment if it fails. Having those jumpers on the rack can save precious production. There might be questions of work space and mechanical clearance that can be taken care of in advance to allow repairs to equipment without chipping concrete and moving columns. Or there might be a need for an emergency water line, or steam main that could be put in during spare time to facilitate quick restoration of service in case of failures. SKULL PRACTICE will point out many more such possibilities.

After the finger is pointed at the villain, the boss must decide what to do about it. How much is it worth? What will it cost? When may we need it? Sometimes when the man in charge is all ready and willing to meet an emergency, you hear it said "That man has a sixth sense. He just knows what is going to happen." Maybe so. But that sixth sense was developed through SKULL PRACTICE; it is not a natural born trait.



Southeast's Largest Electric Furnace To Increase Our Steel Output by 50%

DIXIE'S LARGEST ELECTRIC FURNACE

- Uses as much electricity a day as a city of 10,000 population.
- Makes a heat of steel in about 4 hours, compared to 8 hours or more for an open hearth furnace.
- Can be fully charged in less than 30 minutes, or 7 times as rapidly as an open hearth furnace of the same capacity.
- Requires no pig iron for producing low-carbon steel—uses scrap alone without impairing quality.
- Is equipped to produce highcarbon, special strength alloy steels, including stainless.

To MEET the growing demands of national defense and civilian needs for more steel, we are proud to announce the addition of the Southeast's largest electric furnace to our steel-making facilities.

This new, 60-ton giant will increase our output of steel ingots by 50%, resulting in a corresponding increase in the production of steel products bearing the name "DIXISTEEL."

This one new, ultra-modern furnace will produce half as much steel as our present three 75-ton open hearth furnaces, which produced over 200,000 tons of steel ingots in 1951.

Now more than 300,000 tons of DIXISTEEL will annually find its way into the hands of our customers throughout Dixie, many of whom we have served for more than a half-century.

Atlantic Steel Company

THE OF THE PARTY

ATLANTA, GEORGIA - EMERSON 3441

Industry Speaks



THE TREK SOUTHWARD-Extensive and Varied

S.A.S.I. Publishes Southern Industrial Directory

1952 edition shows that Southern industry is expanding primarily because unexcelled business opportunities exist in the region.

THE South is surely the land of opportunity. While its area and population comprise only a third that of the nation, many industrial leaders have expressed their belief that the South, rich in material resources and manpower, will soon become the industrial center of the world.

Why select the South? Vast mineral resources, labor of an early American stock, good water, cheap gas and electricity, transportation by water and rail, economical location sites, ample elbow room, and a mild climate all combine into a powerful incentive for industrial plants to go South.—M. P. Etheredge, President, S.A.S.I. and Dean of Science, Mississippi State College.

The Southern Industrial Directory provides facts and figures on Southern industrial activity to refute charges that the region's recent progress has resulted from government subsidized plants, special tax inducements, or other artificial factors. The S.A.S.I. report proves that Southern industry is tremendously extensive and varied, and cannot be overlooked as a vital force in the national economy.

The new survey makes it clear that Southern industry is expanding primarily because unexcelled business opportunties exist in the region. The report predicts continued rapid progress and furnishes a wealth of data to support this forecast. It gives assurance that as long as the South obtains fair legislative treatment and private enterprise acts in accord with sound business principles, industry will continue to move South at a rapid pace.

Coverage of the Directory

The Southern Industrial Directory includes an alphabetical index of 3000 large manufacturing plants, with names of executives, principal products, and number of employees; a geographical index identifying major industrial centers; a classified index to several thousand sources of supply for materials, equipment, and services; and a reference section which lists hundreds of industrial development groups, U. S. Government offices, Southern industrial publications, research institutes and trade associations.

In addition, there is a review section which presents maps, charts, and pictures illustrating industrial activities in the 14 states from Maryland through Texas.

Highlights of the Review Section

The South added an average of one new multi-million dollar plant for each working day in 1951.

Texas, Louisiana, Alabama, and Kentucky rank high among all 48 states in new defense plants. Texas leads with approximately 31 billion worth of new plants.

The South now imports from other creas more than \$2 billion worth of industrial equipment and supplies each year. A great opportunity exists for local industries to expand to supply these needs.

The chemical industry is growing faster than any other in the South. Last year, more than half of the nation's chemical plant expansion was in the South.

There are now operating in the South more than 60 large pulp and paper mills, having a daily capacity of nearly 25,000 tons. Nine new mills, involving an investment of \$200 million, are under construction.

The South has taken the national lead in textile manufacturing and is steadily increasing its margin of leadership. The region produced \$2.1 billion worth of textiles last year and paid textile workers \$1.2 billion in wages.

The South outproduces the nation in cotton, citrus, peaches, peamuts, sugar cane, sweet potatoes, rice, whiskey, and tobacco.

Steel and other metal-producing facilities are being greatly expanded. New plants will enable the South to produce more aluminum than any other area.

The South produces \$4.5 billion worth of minerals annually. Southern states lead the nation in output of bauxite, diamonds, phosphate rock, knolin, Fuller's earth, marble, feldspar, mica, zinc and lead ore, ball clay, pyrites, bromine, graphite, helium, magnesium, natural gas, petroleum, antimony, and sulphur.

Who's Who in the S.A.S.I.

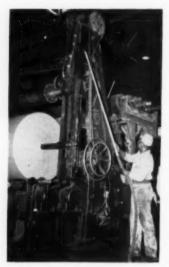
S.A.S.I. Regional Officers for 1951-52 are: President M. P. Etheredge, Dean of Science, Mississipi State College: Vice President, A. B. Paterzon, Chm. Bd., New Orleans Public Service; Vice President, H. R. Hanmer, Director of Research, American To-bacco Co.; Secretary, G. D. Palmer, Professor of Chemistry, University of Alabama: and Treasurer, A. G. Maxwell, Vice President, Citizens and Southern National Bank, Atlanta.

H. McKinley Conway, Ir., is Executive Director of the Southern Association of Science and Industry. Copies of the Southern Industrial Directory are available at \$5 per copy from the association's headquarters at 5009 Peachtree Rd., Atlanta, Georgia.

Stationary vacuum system handles

Industrial Cleaning

Union Bag & Paper Corporation, Savannah, Georgia



Workman using vacuum hose and long-handled brush attachment to cleam one of the paper rewinders at Union Bag and Paper Corporation's huge mill at Savannah, Georgia. Hose leads back to the nearest intake in the vacuum pipe system.

Huge paper machine room . . . usual industrial dust deposits PLUS inflammable paper particles . . . new, modern vacuum system supplanting hand methods now cleans floors, walls, pipes, girders and machinery.

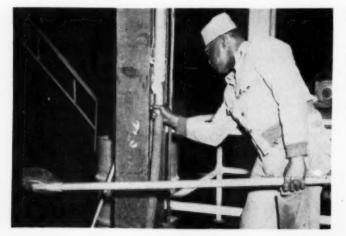
INDUSTRIAL cleanliness is vital to efficient operation and increased production. In any industrial establishment, the problem of keeping the plant clean is a major one for the maintenance man. The paper machine room at Union Bag and Paper Corporation's Savannah, Georgia, plant is no exception, and keeping the room free of foreign material has, in the past, caused its share of headaches.

The plant is the largest integrated kraft container operation in the world, and the paper machine room's size constituted a cleaning problem in itself, since five paper machines, each the length of a city block, are housed under its one roof. In addition to the usual dust, dirt, and grime that accumulate in any industrial structure, the paper machine room had the additional problem of "paper dust," or small pieces of fiber that accumulated on the machines, cutters, and other equipment forming a lint-like substance. This paper dust is highly inflammable, and if left to pile up forms a very formidable fire hazard.

System Design

Up until last spring this essential cleaning job had either been done manually, with brooms and rags, or with very expensive compressed air, but at that time Union Bag took a big step toward reducing its machine room cleaning problem when it installed a stationary vacuum cleaning system. The installation, manufactured by U. S. Hoffman Machinery Corporation, has proved highly satisfactory, and company officials report gratification at the ease and speed with which this particular part of their in-plant cleaning is now accomplished.

The new vacuum cleaning in-



As seen at left, the cleaning hose can be plugged into the Hoffman vacuum system at any one of 75 intakes situated throughout the building. Ten men can clean simultaneously in different parts of the room.

Scope of System

Since Union Bag & Paper Corporation's Savannah, Georgia, plant is the largest integrated kraft container operation in the world, the paper machine room's size constituted a cleaning problem in itself. Five paper machines, each the length of a city block, are housed under one roof.

Vacuum piping and cleaner inlets are provided throughout this large area. Main header of 6 in pipe, 250 ft long, runs along the dry ends of the machines, or the ends where finished apper comes off. Six maller headers of 3 in. pipe lead out at right angles, extending vacuum service down the aisles between the paper machines.

Other pipes lead down almost to floor level with inlet valves to which portable 1½ in rubber hose connections and cleaning tools are attached. There are 75 outlet valves over the system. Total amount of pipe of all sizes making up the system is approximately 2,500 ft.

stallation consists of a size 4306 Hoffman centrifugal exhauster to create the vacuum in the system, a directly connected 60 hp, 440 volt, three phase 60 cycle fan cooled electric motor to furnish power, two dust separators four feet in diameter and eight feet tall, and a system of piping to carry the vacuum throughout the three levels of the building.

Piping and Outlets

Principal area of use of the system is the machine room proper, or middle floor of the structure, where the five machines, longer than a city block and roughly 20 ft wide, are arranged side by side. It is throughout this area that most of the piping is distributed. A main header of 6 in. pipe, 250 ft long, runs overhead along the dry ends of the machines, or the ends at which the finished paper comes off. From this main header six smaller headers of 3 in. pipe lead out at right angles, carrying the vacuum down the aisles between the paper machines.

From 75 inlet valves, dust and dirt is sucked back through the piping to these two centrally located primary and secondary dust separators, set off by guard rails. From 90 to 95 per cent of dust material is collected in primary tank. Collected dust and dirt are removed from both separators through doors in the tank bottoms.

From this overhead pipe work other pipes lead down almost to floor level with outlet valves to which the portable inch and a half rubber hose connections and various types of cleaning tools are attached. There are 75 of these outlet valves distributed over the system, each one equipped with spring closing covers so that they automatically close when the hose is removed. Outlets are also located on the first floor for cleaning in and around certain of the electrical installations located there, and on the third level where exhaust and roof heating equipment (used to cut down on water condensation) has been placed. Total amount of pipe of all sizes making up the system is approximately 2,500 ft.

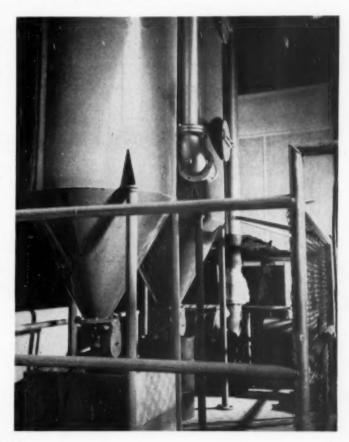
The rubber hose connections that are hooked into the piping system at any of the inlet valves are 50 ft in length, and various types of brushes and attachments are either attached directly to them or to special metal extension handles for reaching overhead and into inaccessible places. As many as ten hoses can be in operation at one time.

At Union Bag practically all types of cleaning in the machine room are done with the installation, and it is used on floors, walls, building structure, pipes, girders, and beams as well as on the machinery. Type of cleaning desired determines what type of cleaning attachment tool is used.

Dust Collection

From these 75 inlet valves the dust and dirt are sucked back through the piping to the two centrally located dust separators. The

(Continued on page 77)



RECORD KEEPING

"Automatic" Maintenance With a Visible Control System

N order to handle a huge maintenance program with a relatively small crew, Temco at Dallas, Texas, has based maintenance operations on three primary objectives:

- 1. To make minor corrections before damage occurs
- 2. To hold machine failure and machine down time to a minimum
- To schedule the work load to the available manpower, thus avoiding idle maintenance time

Translation of these objectives into actual facts has been accomplished through careful planning, scheduling and record keeping. Key to the success of record keeping is a plant tested Kardex visible maintenance control system.

Every Monday morning, a department assistant goes over the Kardex file. He pulls the cards on items which are due for inspection and checks on any cards from the previous week's inspection group which have not yet been returned to file. Leadmen distribute cards to the area maintenance men.



By C. G. HOUSEWRIGHT

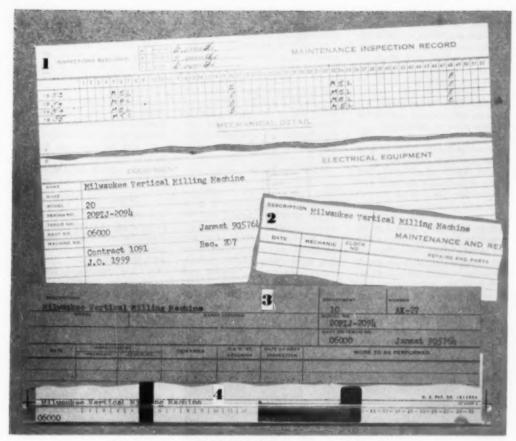
Maintenance Engineer
Texas Engineering and Mfg. Co., Inc.
Dallas, Texas

TEXAS Engineering and Manuturing Company, Inc., commonly known as TEMCO, occupies a one and one quarter million square foot, windowless, air-conditioned factory in Dallas, Texas. Inside this factory is nearly ten million dollars worth of aircraft production equipment ranging all the way from 3,500 ton hydropresses, 60 ft spar mills, Keller and Hydrotel duplicators, and Drivematic riveters to large batteries of brakes, shears, rolls, punch presses, lathes, mills, drill presses, etc.

It is the responsibility of the maintenance department to install this equipment and move it when required, to inspect it and to repair it as required, and in general to maintain it in good operating condition at all times. In addition, maintenance is charged with responsibility for maintaining all mobile equipment, and with the fabrication and maintenance of all handling fixtures as distinguished from production tooling.

Since the TEMCO facility is leased from the Navy and is only part of a larger facility, the maintenance department does not handle basic building maintenance, although it is responsible for erecting partitions and enclosures, painting offices and similar jobs which are related directly to TEMCO occupancy.

At the present time we are handling this overall program with a 215 man crew, exclusive of the woodshop, which comes under maintenance. This crew in-



Three Card Kardex Visible Control System at Temco, Dallas, Texas

are due.

equipment.

Card 1—A white card marked "Maintenance Inspection Record" carries both a mechanical and an electrical description of the equipment and space to provide a periodic inspection schedule for a four year period.

Card 2—This white card is likewise a permanent record and provides space for recording repairs and new parts installed. This information is accumulated from work orders and inspection sheets.

Card 3—This is a "floating" or work record and is removed from the file and issued to the leadman responsible for inspection and work on a date determined by Card 1. Each card file carries a color signal and date slide on the holder.

> in the plant. Portions of each of the three cards are illustrated.

cludes general supervisors, electricians, plumbers, carpenters, welders, machinery repairmen, and clerks, tool crib attendants, etc.

Efficient record keeping is the key to the success of our maintenance operations. The basis of our record keeping is the illustrated Kardex visible maintenance control system consisting of three cards for each piece of equipment

System Operation

With the described set of records established, the basic planning and scheduling of maintenance becomes to some extent, an almost automatic procedure. Principal steps are as follows:

A. A pre-arranged inspection

schedule is set up on the basis of the experience and performance noted on Card #1 (in the top flap of the Kardex pocket) together with information from the maintenance check sheet.

Note how color signals permanently inserted in the visible

margins of the Kardex slides (No. 4) reveal at a glance which

items are due for inspection and processing, and when they

In addition to the Kardex file, a maintenance check sheet is made out on each piece of equipment. Information on this check sheet is taken from the equipment manufacturer's recom-

mendations and modified in accordance with shop experience. These check sheets, together with all work orders and materical requisitions are kept in a separate folder for each item of

B. Color signals permanently inserted in the visible margins of the Kardex slide reveal at a glance which items are due for inspection and processing.

C. When the signal indicates an item is due for periodic scheduled maintenance, check up, or equipment manufacturer's recommendations on such items as repacking bearings, cleaning oil sumps and filters, etc., Card #3 (the "floating" or work record) is withdrawn from the pocket and given to the leadman responsible for that piece of equipment.

D. The leadman enters specific instructions for the job to be done on the work record card and maintenance check sheet, and then routes it to the maintenance man assigned to the job as a work order and report sheet.

E. Upon completion of the repair or inspection, card 3 is returned to the maintenance office, and details taken from the card and check sheet, such as repair work done and/or parts used are posted on the maintenance card (Card 2), which is housed permanently in the lower half of the Kardex pocket, and which provides a continuing record of maintenance activity, thus permitting

us to determine readily the point of diminishing returns on the equipment in question.

F. After the information on the work card is posted on the maintenance card, the work card is returned to its place in the pocket, and the reappearance of the card 3 form through the die-cut circular hole in the visible margin indicate completion of the job. Signals then are advanced to the date specified for the next scheduled inspection.

While the Kardex control system provides us with a sound basic framework for our preventive maintenance program, it is by no means a cure-all, and its success depends to a large extent on careful planning of other phases of our operation, including the organization of the maintenance department, checks and counterchecks both on the carrying out of the Kardex detailed inspections and on factors which could effect frequency and extent of each inspection, procedures for conducting the inspections, and

control of spares and supplies.

Maintenance Divisions

The TEMCO Maintenance Department is composed of four basic divisions, each of which is headed by a foreman: Wood Shop, Maintenance, Construction Maintenance and Janitors, and Night Operations. The Woodshop and Night Operations foremen report directly to the Maintenance Engineer, and the other two foremen report to a general foreman who in turn reports to the Maintenance Engineer.

Manpower Utilization

Primary responsibility for maintenance of machinery and equipment falls to the maintenance group, but in cases of emergency both the construction group and the night operations group are available as "pads" to provide immediate additional manpower. Having these two groups available gives us a flexibility which could not otherwise be achieved.

The maintenance group itself is further broken down into crews with fixed assignments and floating or trouble shooting crews. The fixed crews are assigned to specific machines, groups of machines or departments. The area assigned to one man depends on the equipment and nature of work -a highly complicated machine such as the Drivematic riveter requires the full time of one man. while in other areas, a single man may be assigned several departments; but full plantwide coverage on a specifically assigned area basis is maintained at all times.



Routine inspection of a Cincinnati mill at Texas Engineering and Mig. Co. Area maintenance men are given a week's leeway to accomplish routine inspections. This is allowed so that the inspection can be made both at the most convenient time for the area man and at a time agreeable to the production foreman. In cases where the production foreman can never spare the machine for inspection, Temco falls back on the night shift pad and accomplishes the inspection on the second or third shift.

The floating, or trouble-shooting crews are assigned by trades rather than by machines or areas, and can be sent anywhere in the plant where their particular skills are required.

Fusing our control system and our organization together into a smoothly operating program is accomplished both by carefully planned checks and counterchecks and by having a preplanned procedure for every man involved in the operation.

In order to assure both that the inspection schedules are correct, and that the manpower is available for the required inspection, maintenance and repair, all matters which could affect either scheduling or distribution of manpower are reported immediately by the men assigned to specific departments and areas, and their reports are reviewed almost constantly by the maintenance supervisors.

One of the most important factors in determining maintenance inspection schedules is the work load on each machine or piece of equipment — whether it is being used full time and on one or two shifts. When there is a change in the workload on a particular machine or piece of equipment, this is reported by the man assigned to the area, and a corresponding adjustment is made in the maintenance and inspection schedules.

Manpower distribution is based on current experience and is reviewed daily. In general, it has been our experience that under normal conditions enough men are required in a department or area to perform routine preventative maintenance in 50 per cent of their available time, the remainder being devoted to repairs and special assignments. Under our set-up, any unusual condition which might require more manpower for a limited period can be handled by drawing on the floating crews in the maintenance group, and when necessary, on the construction and night operations groups. This gives us an "experience period" during which we can determine whether a particular area really needs more men on a regularly assigned basis. or whether it just is going through one of those "unpredictable emergency" periods with which we all are familiar.

In addition to these regular checks, critical areas and new machines such as our spar mills are reviewed periodically and discussed for periodical readjustment of scheduled maintenance.

C. G. Housewright, Maintenance Engineer of the Texas Engineering and Mfg. Co., emphasizes that this maintenance control system is not described as a cure-all for maintenance problems, but as a practical system of planning, scheduling and record-keeping which has worked for his company and could possibly be of help to others. It by no means eliminates emergency failures and breakdowns, but it has prevented many which might otherwise have occurred. It has paid for itself many times.

In order that maintenance supervision may devote a major portion of its time to checks, counterchecks, planning, and reviewing, procedures for the routine handling of the preventative maintenance program have been developed to cover as many details as possible.

Every Monday morning, a department assistant goes over the Kardex file where the Kardex folders are filed. At this time, he both palls the cards on items which are due for inspection, and checks on any cards from the previous week's inspection group which have not yet been returned to file. The cards pulled by the departmental assistant, together with the inspection sheets for the equipment to be inspected are turned over directly to the leadmen who in turn distribute them to the area maintenance men.

The inspection consists of going through the items on the check list, observing the machine in operation, and where possible, talking with the operator. It has been our experience that skilled operators can detect forthcoming troubles that would not be revealed in any routine inspection.

If no problems are revealed in the inspection, the card and check sheet are signed off and returned to the maintenance department for recording and return to file.

If, however, the report reveals that some repair is necessary, it then is turned over to the maintenance foreman, who issues the necessary work order. I.ikewise, if the card and check sheet are not returned within the allotted period, this, too, is brought to the attention of the maintenance foreman for investigation.

Spares and Supplies

The final factor in the planning and scheduling of the TEMCO preventative maintenance program is the control of spares and supplies. On wire, switches and other general use supplies, this is handled on a maximum-minimum inventory basis, but in the case of spare parts for large quantities of highly specialized machinery and equipment, the cost of such a system would be prohibitive.

Here again we fall back on our Kardex system, and on our preventative maintenance programs. The Kardex file gives us an experience record on each item of equipment and allows us to predict within limits what spares will normally be required in a given period of time. We then make arrangements to stock these items ourselves, or in many cases we have found that the local representative of the equipment manufacturer was willing to stock items when our experience showed that he could move them in a reasonable period of time. Thus our record keeping actually helps hold down inventory costs.

This is true even on new equipment on which we have no direct experience in that our foremen are able to take the manufacturer's recommendations on spares and scale them up or down in accordance with the experience reflected in our cards on related types of equipment.

In addition to the cumulative experience recorded in the Kardex control file, Card 3 and the inspection check sheets offer a further aid to inventory control in that they supply advance information on items and parts which are beginning to show wear or signs of failure so that such items can be ordered well in advance of the time when actual replacement will be required. This is particularly advantageous in the case of long delivery items.

CENTRIFUGAL PUMPS

Centrifugal Pump Maintenance

ANY discussion of centrifugal pump maintenance must start by emphasizing the necessity of correct application. This is true with any equipment but particularly so with centrifugal pumps, as there are many hydraulic and mechanical design features especially adaptable to certain operating conditions.

Installation

After receiving the correctly selected pump, the first step in good maintenance is proper installation. The pump should be connected to the supply with the shortest and most direct suction line practical. When possible, the center line of the pump should be below low water level to facilitate priming. There should be plenty of room for inspection and maintenance and the area selected should be dry, if possible, particularly if the unit is motor driven.

Generally, pump and driver are mounted on a common baseplate and connected through a coupling aligned by the pump manufacturer and with the pump doweled to the baseplate. While installing and grouting-in, the alignment must be checked and maintained and finally the driver should be doweled to the base when grouting is completely set.

Both suction and discharge piping must be supported independently near the pump so that the casing is not subjected to external strain. Both piping systems should employ as few bends as possible and if valves are used, all throttling should be done on the discharge side of the pump, not on the suction. An important factor in the suction line is to avoid any possibility of air pockets; a gradually rising line to the pump is best, and if any reducers are used, they should be eccentric. (Figure 1).

By J. A. CABLE

Asst. Application Engineer Centrifugal Pump Section Allis-Chalmers Mfg. Co.

Operation

A prime requisite is that the pump must not be started until it has been primed. Many methods of priming can be applied under various circumstances and these should all be maintained as religiously as the pump itself, particularly if it operates intermittently. The minimum requirement of priming is that the water level in the pump must submerge the entire eye or inlet of the impeller so that a complete column of water exists on the suction side extending into the impeller inlet opening.

It is usually recommended that centrifugal pumps be started against a closed discharge valve as at this no-flow condition the power requirement is at a minimum and this will increase the life of the driving motor.

Maintenance

General maintenance for the most part amounts to giving proper care to major points which are (1) stuffing box. (2) bearings. (3) wearing rings. Above all, maintenance should be systematic. It is well to keep records of all periodic checks and from these work out a maintenance timetable. With new equipment, examinations should be made after relatively short periods of operation. Subsequent inspections can be spaced farther and farther apart until a maximum safe interim period is decided upon. All of the following suggestions as to time element for inspections assume that the pump is operating continuously. If yours runs only part of the time, you may change the inspection schedule accordingly.

The stuffing box in centrifugal pumps is well described as "a necessary evil." It is the most prevalent cause of pump maintenance difficulties, therefore, proper stuffing box operation and maintenance cannot be overemphasized. (Fig. 2.)

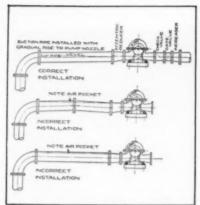
Usually stuffing boxes announce their need for attention by excessive leakage. However, periodic inspection can often point out the need to repack before excessive damage, such as scored sleeves, result. The stuffing box ought to be checked over completely at least every six months.

Stuffing boxes are usually packed before shipment and the supplier's instruction book describes several suitable packings that can be used. Some points worthy of particular attention are:

1—A stuffing box leaks when operating correctly...just a little bit, an indication that the packing is being lubricated.

2—If the liquid pumped contains solids or anything which will be harmful to the packing, an external source of clear sealing water is necessary. Be sure that a good air-tight joint is made in this sealing connection as any in-leakage of air at this point can cause loss of suction or air binding of the pump.

3—When repacking, in addition to using the proper type and grade of packing, the mechanic should make sure that the same number of packing rings are put back into the same relative locations so that the seal cage or lantern ring properly matches the opening provided to feed water to it. Never replace only a couple of the more easily accessible outer rings. Do the best job you can in cutting the rings to just the right length and staggering the joints of the cut ends by at least 90 degrees so that there is





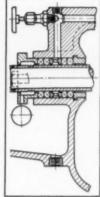


Fig. 2—Arrangement of standard stuffing box.

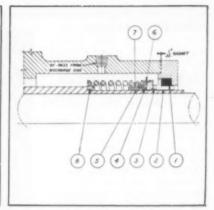


Fig. 3-Crane mechanical shaft seal.

not a continuous path through the packing joints. When repacking has been completed, the rotor should turn easily by hand. It is well to restart the pump with packing quite loose—just tight enough to prevent inleakage of air—and then gradually tighten up until this leakage reduces to a slow drip.

Leakage should be piped away directly from the tap in the well beneath the stuffing box, but if allowed to drip to the baseplate, it can be carried away from the baseplate drip run drain.

4-Another method of stuffing box sealing which is becoming increasingly popular is the mechanical seal. (Fig. 3.) These seals are precision products which must be treated with care. They are particularly adaptable to pumping clear liquids and many standard types can also be used on liquids with solids in suspension where the solids are not finer than about 200 mesh. Where necessary, special arrangements such as double seals with an external source of lubrication, can be satisfactorily applied.

Once the pumps have been dismantled to where the seal faces are disturbed, it is necessary to renew or refinish these sealing surfaces before reuse. Therefore, it is important with mechanical seal-fitted pumps to keep spare parts on hand for the seal faces to prevent excessive downtime. Many seal manufacturers will refinish

the surface of these parts for you, so one set of spares per stuffing box should be ample.

Bearings

Most standard pumps today are equipped with ball bearings arranged for grease or oil lubrication. It is well to check bearings temperatures with a thermometer about once a month. The maximum desirable operating temperature for ball bearings is 180 F. Their overheating is often caused by overlubricating, especially putting in too much grease. If changing lubricant doesn't reduce overheating, dismantle and check the bearings and coupling alignment.

Regardless of temperature findings, it is a good idea to wash out oil wells with kerosene and refill them with a recommended lubricant about every three months. Grease lubricated bearings can be checked at the same intervals for saponification, easily recognized by the grease becoming whitish in color. If this happens, check bearing seals for inleakage of water or other foreign fluid.

Wearing Rings

When originally assembled, wearing rings on the impeller and in the casing provide a close clearance fit which is intended to reduce leakage from the discharge to the suction side of the impeller to a minimum. Since excessive clearances allow increasing amounts of re-circulation within

1—Synthetic Rubber Seat, 2—Floating Seat, 3—Sealing Washer, 4—Ferrule, 5—Flexible Synthetic Rubber Bellows, 6—Retainer Shell, 7—Driving Band, 8—Spring Holder.

the pump, they should be watched and kept within reasonable limits. At least once a year, the rotating element should be removed and these clearances inspected.

Generally speaking, the diametrical clearance should not be allowed to exceed .003 inch per inch of diameter of the mating rings. It is well to periodically record the output of each pump as to head and capacity and when either falls off appreciably, the rings on the impeller or in the casing, or both, probably need replacement. Here again, periodic checks may locate worn parts before they get too extreme and sometimes only one pair of rings need be replaced.

With special types of pumps having single suction impellers and adjustable end clearance wearing fits, it has been found definitely advantageous to periodically adjust the clearance. This distributes the wear better and gives longer life to both of the surfaces that provide the close clearance.

In the long run, some sort of regular inspection should be practiced with any mechanical equipment. Centrifugal pumps are no exception and their tour of duty can be measurably extended by proper care, especially if the right pump has been purchased for the job.

INDUSTRIAL FLOORS

By RAYMOND SEYMOUR

The Atlas Mineral Products Co. Mertztown, Penna.

A NATION-WIDE survey has indicated that there are more damaged floors than good ones in the American food processing industry. Unfortunately, the rate of damage resulting from disintegration is on the increase but fortunately a technique has now been



A portion of a dairy floor showing tile joined with Portland cement which included an iron filing additive. Not only have the joints disintegrated but the tile has been chipped and eroded.

Floor Repair Procedures Improved

developed which holds considerable promise for the industry.

Satisfactory tile floors joined with furane cements have been available for over ten years for dairies, ice cream plants, canneries, breweries, distilleries, meat packing plants, commercial kitchens, bakeries and other food processing plants. However, while the annual cost for such construction was not excessive. the higher initial installation cost sometimes favored inadequate con-The food processing struction. plant owner has often been told that the use of admixtures, such as iron filings with Portland cement for joining tile might be suitable in this plant. A simple test would show that these materials will disintegrate when dropped in a can of sour milk but he often reasoned that sanitary conditions prevented any food acid formation in his plant.

Severe Service

The degree of attack by food acids is often related to sanitation methods; but degrees of attack are like degrees of death... a little bit dead or completely dead. The problems associated with attacks by food acids increase tremendously as the size of the plant grows. In addition, modern technology has in-

While this discussion deals most specifically with conditions in food processing plants, the generalities apply to all types of industries.

troduced corrosive conditions unheard of in the "old-time" food processing plants.

Hot water and soap were considered adequate for food plant cleaning at one time. Today, it is not uncommon to use super-heated steam and highly alkaline synthetic detergents. The trend towards higher alkalinity, of course, must stop at a pH of 14 but the improvements toward superior detergency will never stop. The food processing industry has accepted improvements in detergent efficiency and the use of acid cleaners in order to promote superior sanitation. In doing so, it must also accept the necessity for adequate materials of construction throughout its plants.

The modern food processing plant must be modern and efficient in order to be competitive. The resultant complicated equipment and machinery brings many additional headaches that did not exist when this industry operated on a simpler pattern. Techniques have now been developed for the destruction of

milkstones and beerstones in dairy and brewery equipment and similar techniques will doubtlessly be introduced for the solution of problems in other food plants. Some of the standard methods used, require strong acids such as phosphoric acid and the food plants using these techniques must have equipment to stand up against corrosives.

Repair Methods

There are, of course, a few "bootleg plants" in the food processing industry and these are not restricted to distilleries. Such plants do not worry about bacteria or unsanitary conditions, but all legitimate food plants are under the supervision of health authorities. Since the health of the consumer is dependent upon the action of these authorities, they have usually insisted that cracks, crevices, open joints and other faulty floor conditions permitting putrefaction be renaired.

Previous attempts at floor repair have usually consisted of just more of the same construction. Portland cement does not adhere well to itself in thin sections and, therefore, it should not be used in repair work. The inability of Portland cement to adhere can be overcome in part, by the addition of iron filings or asphalt emulsion. Repairs with such materials may be adequate for floors subjected to mechanical abuse but are not suitable for food plant floors since these materials are attacked rapidly by food acids.

Since properly installed furane floors are satisfactory for both mechanical and chemical resistance. attempts have been made to use furane cements for floor repair. Dry, clean areas under service for at least three days at 65-85 F are usually required for repairs using these cements. The acid catalysts present react with Portland cement, alkaline cleaning agents and admixtures, such as iron filings. And if such reactions take place to even a small extent, the furane cements do not harden. The fact that food plants cannot maintain dry, warm floor areas for long periods of time. coupled with the inhibiting effects of alkaline materials, makes the use of furane cement impractical for floor repair in food plants.

Plastic Cement

The most promising solution for food plant floor repair work requires the use of a relatively new synthetic plastic cement whose hardening process is essentially unaffected by the presence of moisture or alkaline materials. It is available as a black or white cement so that it can blend with the color of the joints being repaired. This product called Vitroplast can also be used to repair cracks in concrete floors. Its adhesion to concrete and other ceramic surfaces is outstanding. While best adhesion is secured on dry surfaces, this plastic product will also set under

The first step in floor repair is to remove all debris, grease and loose Portland cement. Providing the local health authorities will permit it, it is preferable to allow Portland cement joints to disintegrate to a minimum depth of % in. before attempting repair. Otherwise, time must be spent in chipping or sawing out the old joints.

It is important to remove all Portland cement from the vertical edges of the tile in the open joint. The Vitroplast will adhere to Portland cement but joints thus formed will be vulnerable spots which will allow attack in depth and yet leave apparently solid joints. The tile and the plastic cement are immune to attack by food acids or ordinary mineral acids and it is essential that no non-resistant materials be in contact with the corrosive conditions.

It is recommended that any Portland cement adhering to vertical surfaces of the tile be removed by brushing with 10 per cent muriatic acid. This step should be followed by treatment with 10 per cent trisodium phosphate solution and a water wash. The open joints should be dried as well as possible and then pointed with freshly mixed

plastic mortar. The excess should be struck off and then allowed to harden undisturbed.

Obviously, all the requirements for good installations cannot always be met but as many as possible of the precautions cited should be observed. The directions for repairing cracks in concrete floors, etc., are essentially the same as those for tile joints. These cracks are usually fairly narrow and should be chipped out wide enough to secure an adequate bond on a clean surface.

Regardless whether the floor to be repaired is tile or just Portland cement, it may be placed in service within a few hours after the repair, providing the temperature is above 65 F. While the repaired floor will be inferior to a new one of proper design, it should give adequate service.

Stationary Vacuum Cleaning System

(Continued from page 69)

line enters the primary separator near the top through a tangential inlet, and dust clumps are directed against a cylindrical baffle to facilitate proper separation. Most of the particles settle to the bottom of the separator—from 90 to 95 per cent of the dust material is collected in this primary tank—and the air containing the remaining finer particles is drawn again from the top of the unit. This primary separator has a dust storage capacity of 90 cu ft.

The air next enters the secondary separator tangentially about two-thirds of the way down the tank's length, and because of the centrifugal action of the material entering the separator, a large percentage of it immediately drops to the bottom. Only the extremely fine, or "lighter-than-air" dust, rises with the air currents toward the separator's top, where it is trapped by 30 specially designed filter bags located in the upper part of the separator at a level well above the intake. The separator is equipped with a bag shaker operated by an external hand lever for cleaning, and since the bags never are allowed to become filled with dust, they do not have to be removed for cleaning. Dust storage capacity of the secondary tank is 33 cu ft.

The collected dust and dirt is removed from both the separators through doors in tank bottoms.

From the secondary separator the air is drawn through the exhauster, which is of the multistage centrifugal type, and which is housed by a series of cast iron sections secured by tie rods between inlet and outlet end castings. The impellers are of onepiece cast aluminum alloy, keyed to a heavy steel shaft, and are accurately balanced both statically and dynamically. A vacuum of approximately 9 in. of mercury is maintained by the unit. The exhauster is mounted, along with the motor, on a bed plate so that the two form one compact unit.

This vacuum cleaning system has proved very effective at Union Bag, not only for its labor saving and fire hazard reducing properties, but by concentrating all cleaning equipment in a central location, permitting widely separated parts of the building to be cleaned simultaneously, and collecting all dust and dirt at one point ready for removal.

PLANT LUBRICATION

Lubrication Manual

Tennessee Eastman Company, Kingsport, Tennessee

Tennessee Eastman Company at Kingsport, Tennessee, has for many years been developing and improving a program of standardized lubrication practice. Some details of the development of the present program were described by B. H. Jorgenson* in the May 1951 issue of Southern Power and Industry.

Now that value of the lubrication program has been proved in practice, we describe here the LUBRICATION MANUAL which serves to coordinate and standardize efforts of the various men and departments that are concerned with lubrication in that large diversified industrial organization.

EVERAL years ago, the man-SEVERAL years ago, became concerned with what appeared to be an excessive number of lubricants specified, purchased, stocked and used. A committee of maintenance engineers of various divisions and departments of the plant was appointed by top management to study this problem. The committee functions in accord with a definite Organization Chart and is advised and assisted in its work by staff organization of Purchasing, Stores, Testing Laboratory, and the Material Standards Department.

The records of all lubricants used and consumed in the plant for the previous year were carefully examined. It was found that 57 types of lubricants were considered "necessary" at that time for the adequate lubrication of plant equipment. After a searching investigation concerning the need for each of these types, and following much argument, much discussion and a great deal of compromise, the committee reduced the number of oils and lubricants from 57 to 12 standard types. As can be understood, this objective was not accomplished

overnight. The entire program covered several years and is still continuing.

In addition to eliminating the confusion that always results from the use of a large variety of supplies, actual and continuous experience with the twelve standard lubricants adopted by the committee reflects a much more satisfactory lubrication perform-

*Mr. B. H. Jorgenson, Material Standards Department, Tennessee Eastman Company, Kingsport, Tennessee, been consistently active in the lubrication program, and has helped the editors in preparing this brief dis-

- CHARACTER OF TEC OILS -

The general description of the standard lubricants given below is necessarily restricted. Many variable factors affect the performance of lubricating oils in service. The description and uses presented are intended to give a general idea of the character of the lubricant.

The load carrying capacity of any of these lubricants is influenced by speed, bearing area, pressure, length of bearing, clearance and temperature. Before any lubricant is decided upon for a given piece of equipment these factors should be carefully considered.

This is a light non-lubricating oil which is intended primarily for use as an hydraulic medium, on concrete forms, a floor oil, and cut-ting oil.

Turbine Lubricating Oil

This is a highly refined petroleum oil containing oxidation and anti-rust additives and is for use in direct connected turbines, high speed hydraulic systems; and may also be used in systems where small amounts of steam and condensate are encountered.

Heavy Lubricating Oil

This is a heavy lubricating oil with oxidation and anti-rust addi-tives, for use in reduction gears operating under normal load, for gear motors and for crankcases of heavy duty air compressors and vacuum

Steam Cylinder Oil

This is a high grade cylinder oil compounded with five to seven peent of acidless tallow, for use as a steam cylinder oil for boiler fee pumps, boisting enginee, and small locomotives using low pressure we

Straight Mineral Oil

This is a high grade straight mineral oil and is intended for steam cylinders using high pressure, highly superheated steam and other high temperature conditions such as exist in Terry and Coppus turbine ring oil bearings. It shall be satisfactory for bearing use for starting temperatures of 80°P, or more.

Medium Lubricating Oil

Medium Labricating Oil
This is a medium lubricating oil with oxidation and anti-rust additives, It is intended for use in auxiliary turbines, small turbine drives, turbine reduction gears, where gear and turbine are on the same oiling system, ring oiled bearings in pumps, motors and fans, slow speed hydraulic systems, internal lubrication of air compressors, line shaft bearings, air tools, motor bearings, crankcase of light duty air compressors and vacuum pumps, and a general purpose oil for all ordinary inbrication. This oil should not form any objectionable carbon in use. It is suitable for use in F-11 compressors.

Ammonia Compressor Oil

This is a highly refined petroleum oil with a very low pour point for the lubrication of ammonia compressors, outside machinery subject to freezing temperatures, hydraulic trucks and door checks where ne rubber scals are present.

Extra Heavy Lubricating Oil

This is an extra heavy oil intended for use in gear motors, power heads on spinning machines, and enclosed chain drives.

Heavy Engine Oil

This oil is intended for a steam cylinder lubricating oil for loco tives using high pressure dry steam, for elevator worm gear reduc-units, cables and beavy duty seaclosed reduction gears.

ance than was obtained through the use of the 57 types formerly thought necessary. Significant savings have resulted, not only through simplification of work

and decreased maintenance costs, but because of purchasing and stocking fewer varieties of oils and greases.

The accompanying tabulations:

"Character of TEC Oils" and "Character of TEC Greases" are reproductions of pages 5 and 9 of the manual.

To transmit information in a

LUBRICATION SCHEDULE - MOTORS

This schedule in general applies to motors repacked with T.E.C. 2027 or 2028

| Conditions | Intermittent Operation 40, 50 and 55° Motors, 3600 RPM and Slower | 40° Motors, 1800 RPM | Continuous Operation 50 & 550 Motors, 1800 RPM and Slower | Continuous Operation 50 and 56° Motors, 3600 RPM |
|--|---|--|---|--|
| | One and two shift operation, 40° motors, 1800 RPM and slower | One and two shift operation, 50 & 550 motors, 1800 RPM and slower | Continuous Operation 400 motors, 3600 RPM | |
| Facilities for Add- ing Grease to Motor Bearings | | One and two shift operation, 40° Motors 3600 RPM | | |
| No facilities to add grease | Repack every 8 years | Repack every 4 years | Repack every 2 years | Repack each year |
| Facilities for inflow of grease only | | Add once each 2 years Repack every 8 years | | Add once each 6 mos. Repack every 2 years |
| Facilities for inflow and relief of grease | | Add once each 3 years Repack every 12 years | | Add once each 5 mos. Repack every 4 years |

Lubrication

Ball and roller bearings should be lubricated with grease in all cases where normal operating speeds or temperatures are involved. Extreme conditions of dirt, moisture, or corrosive atmosphere around the bearing usually call for grease lubrication but should be studied on the basis of their own peculiar conditions and with the assistance of the TEC Lubrication Engineer bufore a final decision is made.

For this purpose "normal operating speeds" shall be considered to be any speed less than 2,000 surface feet per minute calculated on the bearing circumference existing at the center of the balls or rollers. This usually corresponds to radial speeds of 1,800 rpm or less. "Normal temperatures" shall be considered as any temperature not under 40° F and not over 140° F.

Grease Lubrication

All ball or roller bearings should be provided with 2 holes for grease lubrication if at all possible; one for greasing and the other for venting while greasing.

When two holes are available; one hole should be at the top of the housing and the other should be at the bottom. The filling hole and the drain hole abould be on opposite sides of the bearing wherever a small amount of grease leakage can be tolerated. The upper hole should be provided with a standard button-head straight industrial fitting and the lower should be provided with an LP.S. pipe plug. Both fitting and plug should be provided by the manufacturer. The plug should always be removed while greasing and the unit should be run for approximately 8 minutes before replacing.

When only one hole is provided the hole should be provided with an I.P.S. plug. The bearing should be lubricated by inserting a soft copper tube on a gun into the hole and pushing the grease in. The unit should be run for approximately 5 minutes before replacing the plug.

All fittings and vent plugs should be extended sufficiently to be readily accessible to the oiler. Drain pipes should be held to maximum diameter and minimum length.

Pana should be provided under all bearings from which grease or oil can drop and be a nuisance or damage product.

The date on which every piece of equipment is greased should be recorded.

Oil Lubrication

Ball and roller bearings except on electric motors should be lubricated with oil when operating speeds are in excess of 2,000 surface feet per minute, when the operating temperature exceeds 140°F., or when other factors peculiar to a given installation make the use of grease undesirable. In all cases the TEC Lubrication Engineer should be consulted to make sure that proper lubrication is obtained.

Wherever the hazard of product contamination is not too greal, oil for lubrication of ball and reller bearings should be provided by means of an oil reservoir. The reservoir should always be provided with a readily accessible opening and a means for venting. All openings should have dust tight covers. Oil should be drained at 6 month intervals on continuous duty equipment and yearly on 8 hour daily duty.

The oil level in the reservoir should never be higher than 1/8 of the diameter of the lowest ball or roller. Suitable coll level indicating devices should be used wherever possible. Oil level should be determined both with bearing at rest, and white running. The two levels should be marked on the lubricating device. As operating speeds are increased this level should be decreased or splashers provided depending upon the particular design in question.

Where the hazard of contamination to the product entats, bearings may be lubricated by applying specified quantities of oil directly to the races with a metering oil can at specified intervals of time. The quantities of oil and the lubricating intervals must be very carefully worked out to insure proper lubrication.

Particular attention must be given to the provision of the necessary pans or guards for drippings when oil lubrication is used.

If the oiling interval on any bearing is more than two weeks, a record should be made. No record should be made for bearings having an oiling interval less than two weeks.

Selection and Use of Greaces

Grease consist of petroleum oils which are combined with various soaps." The soaps which are employed to hold the oil or give it body ree formed by aspontfying various animal fast with alkales in the resence of water. The standard TEC greases include calcium and oilum soap greases. No fillers of any kind are used in the standard

Calcium soap greases are limited in melting point to approximately 200°F. They are smooth in character. They lack stability at high temperatures. They may be used where water is encountered.

Sodium soap greases have higher melting points than the calcium base greases, and under heat and pressure they maintain their stability to a greater extent than the calcium soap greases. They are not adaptable where water is encountered.

In selecting the proper grease, consideration should be given to the operating temperature of the bearing, the service conditions, the method of application, frequency of service, speed, and type of bearing housing. In selecting a grease for ball or roller bearings, care should be taken not to select a grease which will channel (lay away from bearing). A grease which is too stiff at the operating temperature, or too stable, will channel and cause bearing failures. The softest grease stable, may be retained by the bearing faulteness. The coftest grease satisfactory lubricant. reasonable length of time is usually the most satisfactory lubricant.

In using greases it must be remembered, a separation of the oil and tony takes place eventually. Where greases are used for lubricating

enclosed ball or roller bearings, it will be found necessary to establish necessed half or roller dearings, it will be found necessary is schedule of service depending upon the operating conditions oller bearings, generally, should be cleaned out once a year.

On page 10 is shown the physical characteristics of the standard greaces which satisfy the most general usage. The following provides a description of the standard season and examples of use to serve as a guide, but in several the considered a definite recommendation; this, because of the great variance in operating and service conditions of any piece of equipment.

Medium Cup Grease

This grease is a combination of refined mineral oil and calcium soap. This is a medium cup grease for use on all bearings operating under normal temperatures and loads. This grease can be used where moisture is present and where conditions make frequent greasing necessary.

Bearing Grease

This grease is a combination of refined mineral oil, calcium and sodium soap. It contains about 25 per cent calcium and sodium soap with a working range from -30°F, to 500°F. It is especially made for motor bearings in hot dry places. This grease is not water resistant. This grease can and should be used for hand packed ball bearings where it is expected to last for several years.

Ball and Roller Bearing Grease

Hall and Holler Hearing Grease
This grease is a combination of refined mineral oil with rust and oxidation inhibitors, and sodium, or mixed base soap and shall have a melting point of not less than 190°F. It is required and will be used, for grease gun application where a better grease than 2025 is needed. This grease is to be used where a three to aix month achedule of inspection is maintained on ball and roller bearings.

practical manner to the lubrication men in the plant, a practice manual of 30 pages was prepared. The objective of the manual was to simply describe the characteristics of the lubricants, and indicate the uses for which they are intended. The manual was written for the men in the plant, and was designed to eliminate as much of the technical material as possible. and yet clearly describe the lubricants and the various methods of application. The manual also describes the fundamentals of lubrication in a practical manner and contains officially approved procedures to be followed in lubrication matters by all concerned throughout the plant.

A reproduction of page 14 of Tennessee Eastman Corporation's lubrication manual is shown on the preceding page.

Lubricant tests which are made in the laboratory are briefly described in order that their significance may be understood by the plant personnel. The importance of regular schedules and frequent inspections, and the damage that can be done to expensive equipment by contamination and careless handling of lubricants are carefully pointed Procedures for receiving. storing, and sampling lubricants are fully described and responsibility for each of these functions is established.

The manual is revised as often as necessary to keep it un-to-date so that each man responsble for and it is given a wide distribution

any phase of the maintenance of equipment is provided a copy.

Scope and Coverage

The scope and coverage of the manual is best explained by the following reproduction of the table of contents:

Introduction

Equipment with Lubricant in Use

Character of TEC Oils Physical Characteristics of TEC

Tests for Lubricating Oils Character of TEC Greases Tests of Greases Methods of Lubrication

Lubrication of Ball and Roller Bearings

Lubrication Schedule

Lubrication of Gears

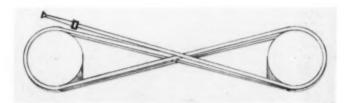
List of Standard Oils and Greases

Viscosity - Temperature Chart of TEC Oils

Procedure for Sampling and Testing Lubricants

Lubricating Devices

As an illustration of the manner in which the manual is compiled page 14 (Lubrication Schedule-Motors) is reproduced herewith. The other important subjects listed in the above table of contents are handled in a similar manner.



How to Coil Hose, Rope and Cable

THE accompanying sketch shows how to coil hose, rope, wire, etc., on a wall rack so that there will be no "kink." The reason the old troublesome "kink" is eliminated is as follows: you first coil the hose around one support in one direction, and then coil it around the other support in the opposite direction. The kink that tends to form with the first turn is neutralized with the second turn, and as a result there isn't any kink at all. Not only is this method a time saver, it is a hose, rope, and cable saver .- Leslie Rood, Louisiana.

How to Take Care of Your Rope

OVER the years a great many rope designs have been developed for special purposes. Some of these are important and necessary, but many slight variations have been made for psychological reasons.

The general purpose rope available at all supply stores will do most jobs requiring rope, both efficiently and economically. This rope is the result of many years of experience and combines most rope characteristics to their best advantage and will be found adequate for most conditions.

Data courtesy, Plymouth Cordage Co.

— Do —



REMOVE ROPE FROM COILS PROPERLY—With right laid rope, lay coil flat with the inside end at the top. The coil should then unwind from the inside in a counterclockwise direction.



STORE ROPE PROPERLY—A dry, unheated room with free-air circulation is the best place to store rope. Place rope in loose coils off the floor on wooden grating, or hang on wooden peg.



DRY ROPE PROPERLY AFTER WETTINGS—A wet rope should never be stored without air circulation—make sure that it in thoroughly dry, to avoid loss of life and strength.



KEEP ROPE CLEAN—If your rope gets dirty, wash with clean water dry thoroughly before storing.



SHEAVE ROPE RIGHT—Small sheaves increase both the wear on rope and the friction load. Never use a smaller sheave than is recommended for the size of rope you are using.



REVERSE ENDS—Reverse rope, end-for-end, periodically, as in tackle use, so that all sections of the rope will receive equal wear. When rope wear is localized in a short section, periodical shortenings present a new wearing surface.

D(

DON'T OVERLOAD ROPE—The safety factor of a rope is the ratio between minimum breaking strength and the load applied. A safety factor of 5 is recommended under ordinary circumstances. Allow for the condition of the rope when determining the safety factors.

Don't



DON'T USE ROPE AROUND SHARP ANGLES WITHOUT PRO-TECTION—While fiber rope is more clastic than wire rope, it is good practice to avoid sharp bends whereever possible. Sharp bends reduce the tensile strength of rope by putting extra strain on the outer fibers.



DON'T KEEP GUY ROPES TIGHT DURING A STORM — When ropes are used as guy lines and other supports, exposed to weather, they should be slacked off to prevent overstrain due to shortening from wetting.



DON'T LUBRICATE YOUR ROPE

—A well-made rope is properly lubricated by the manufacturer—and is adequate for its service life.



DON'T CONTINUOUSLY TWIST ROPE IN ONE DIRECTION—If the use of rope involves continual twisting in one direction, compensating turns must be thrown in or out to avoid damage to the rope structure.



DON'T PERMIT UNNECESSARY WEAR AND ABRASION — Surface wear may come from allowing one rope to chafe another, or by dragging it over sharp or rough objects. When rope must run over some surface, such as cleats, winchheads, etc., be sure that the surface is smooth.



DON'T EXPOSE FIBER ROPE TO CHEMICALS OR CHEMICAL FUMES — Many chemicals are very injurious to rope fibers. Rope should not be stored in close proximity to chemicals, especially acids, alkalies or their fumes.

SIMPLIFIED MAINTENANCE IN AN OKLAHOMA MILL

General Mills, Inc. Oklahoma City, Okla. Shows How



Extensive Flour Mill Modernization Cut Maintenance Costs

THE Oklahoma City plant of General Mills has been extensively modernized in the past ten years, partly as a result of scheduled maintenance and partly to meet needs for major changes in equipment.

In the General Mills organization, the Manufacturing Department is responsible for operating the entire plant facilities at each location and is also responsible for the maintenance of all buildings and property. The Oklahoma City plant happens to be one where Divisional Offices are located and a complete service building houses these Divisional Offices attached to the plant proper.

The Manufacturing Department is responsible for the maintenance of the building and its air conditioning and heating system. The refrigeration system includes two direct expansion Westinghouse freon compressors, one 25-ton and one 7½-ton. These units are driven by electric motors totaling 35 hp. There are also two Westinghouse conditioning units and one U. S. Air

Co. EC-10, 10-ton evaporative condenser. Steam for heating coils is supplied by one Pennco, Type 5115A, fully enclosed natural gas fired, horizontal, sectional boiler. Equipment is controlled by Minneapolis-Honeywell temperature, humidity, and heating controls.

The maintenance of the building in the Divisional Offices concerns routine painting and small repair jobs. Such work must be handled on week-ends or holidays. If a very big job occurs, it is handled by out-

Highlights of the Ten Year Program

Modern machinery and methods plus routine scheduled maintenance have paid off at the Oklahoma City flour mill of General Mills, Inc. This report covers a few of the modernization features incorporated during the past ten years.

- Line-shaft power distribution method in wheat cleaning facilities supplanted by individual motor drives
- ▶ Conversion to electric motor drive and purchased power
- ▶ Modern switchboard equipment
- ► Automatic piped fumigation system
- Completely modern tiled change rooms and rest rooms—19.6 sq ft of such facilities for each employee

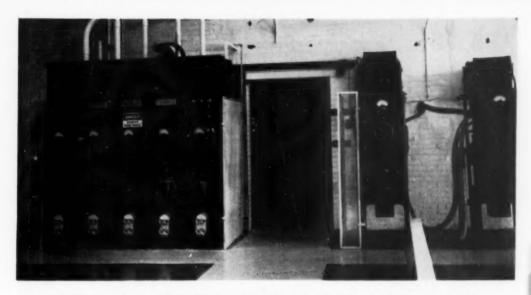
Modernization continues at General Mills. The above phases, only recently completed, have already simplified maintenance problems, reduced breakdown time, and improved plant appearance.

By C. H. SMITH

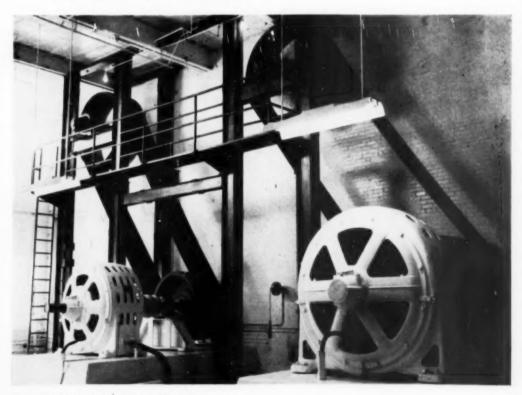
General Superintendent Southern Area, General Mills, Inc.

Who's Who at General Mills

This extensive plant modernization at the General Mills Oklahoma City plant has been handled under the direction of W. W. Knight, former Plant Superintendent, Angus M. Bain, present Plant Superintendent, A. R. Smith, Mechanical Department Superintendent, and C. R. Price, Milling Superintendent.



Oklahoma City plant is made up of two separate and complete milling units, previously driven by a steam engine through a 42 in. heavy leather belt and heavy cross drive with idlers. Each unit could be operated separately by disengaging friction clutches on the main line shaft. With the installation of the separate General Electric motor drives, plant engineers were able to remove the old friction clutches and install flexible couplings making it possible to operate either milling unit independently. A new modern switchboard gives adequate protection to personnel and equipment.



SOUTHERN POWER & INDUSTRY for MAY, 1952



Section of the Oklahoma City maintenance shop. Ten men are employed for general plant maintenance and installation of new equipment.

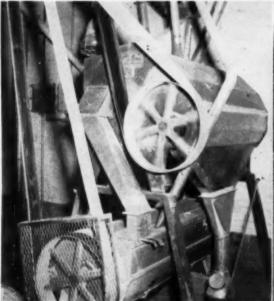
side contractors. About three manhours per week are spent by plant maintenance crews on the smaller jobs.

General Plant Maintenance

Approximately ten men are employed the year around for general

plant maintenance and the installation of new equipment. Careful accounting records are kept of all expenditures and definite proce-

Modernization of wheat cleaning facilities featured changeover to individual motor drives rather than the lineshaft power distributing method. Note improvement in general appearance.





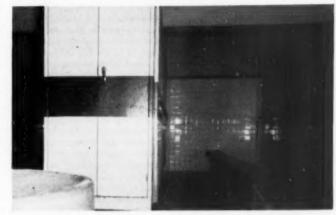
dures are followed in securing approval for maintenance expenditures and capitalized items. On the basis of historical records of actual expense of previous years, General Mills plant maintenance is very carefully budgeted.

One painter is employed full time to handle interior painting and the exterior painting is renewed once every two to five years by an outside contractor. Bullseye Enamel has been found very satisfactory for coating inner surfaces of spouting. Sherwin-Williams "Tropical" and "Steelcote" paints are generally used for floors and walls. Western "Lasting Coat" Varnish is used wherever this type of finish is needed.

Wheathouse Modernization

A rather general modernization of the wheat cleaning facilities has taken place in the past two years. In general, this modernization consisted of new types of equipment with a changeover to individual motor drives rather than the line-shaft power distributing method.

This phase of the modernization



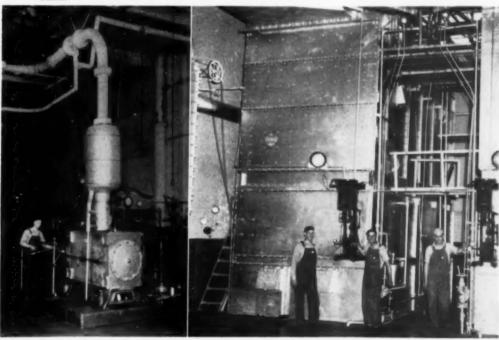
Change and rest rooms were completely modernized. General Mills now has 19.6 sq ft of such facilities for each suppleyee of the Oklahoma City plant.

program saved overall power of about 75 hp per hour. In addition, the appearance was generally improved by replacing the wheathouse conveyors with stainless steel spouting supplied by the Metal Goods Corporation.

Explosion of a fly wheel on one of the small gas engines, which occurred at this plant in April of 1951, speeded a decision to change over to electric motor drives and purchased power in place of manufactured power as previously used. Power is now purchased from the Oklahoma Gas and Electric Company.

New power equipment consists of

The old and the yew in power plant equipment. The old steam engine and auxiliary equipment at the left has been removed. General plant heating is supplied by Kewanee, Type C, steel heating boiler with Webster gas burner.





One phase of the wheathouse modernization was the replacement of conveyors with stainless steel spouting, supplied by the Metal Goods Corporation.

one General Electric 350 hp, 257 rpm, 2300 volt motor complete with control panel; one General Electric 300 hp, 294 rpm, 2200 volt motor

complete with control panel. Drive belts are connected to one Rockwood paper drive pulley 55 in. dia x 30 in. face; and one Rockwood paper drive pulley 64 in. dia x 30 in. face.

General plant heating is supplied by a 7L80 Kewanee Type C, steel heating boiler, with Webster kinetic natural gas burner and necessary automatic controls. The unit operates at 10 lb steam pressure.

Supplemental equipment includes one 2400 volt main breaker with current transformer, one 100 kva Pyranol transformer, one 10 kva dry type 3 phase transformer, three 250 kva transformers and a power distribution panel.

The plant cooling towers, visible in the general view of the plant on the opening page of this discussion, consist of a 1000 gpm capacity Fluor redwood unit and a Marley #5, Type U-1227 unit.

For an indication of the improvement and appearance in changing over the power plant check the illustrations, showing two of the boilers which provide steam, the old steam engine, and the smaller engine where the explosion occurred.

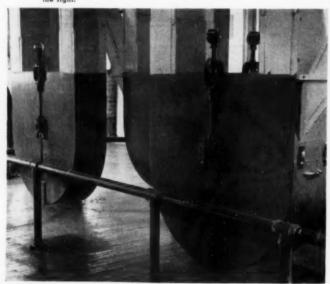
The Oklahoma City Plant is made up of two separate and complete milling units previously driven by

one steam engine as a prime mover through a 42 in. extra special heavy leather belt and a heavy cross drive with idlers. Each unit could be operated separately by disengaging friction clutches on the main line shaft on each milling unit. With the installation of separate motor drives, we were able to remove the old friction clutches and install flexible couplings, since the individual motors make it possible to operate either milling unit independently. While we have not operated it on the new basis long enough to get an accurate comparison, it appears that the direct power costs will be slightly higher using purchased power. As a general policy our company has been changing to motor drive and purchased power as circumstances warranted. The reason the Oklahoma City conversion did not pay off as well as it has in most of our power conversions was that the gas rates for fuel in Oklahoma City are relatively low compared with other sections of the country and also the old steam power equipment was greatly depreciated.

Fumigation System

We have recently installed an Arrowside Automatic Fumigation

New type elevator boots, manufactured by the Southwest Mill and Industrial Equipment Co., of Oklahoma City, simplify plant maintenance. Some of the machines used in the milling process for separation of milling stocks had previously been constructed with small conveyors under each machine for gathering up and distributing the material separated. These conveyors have been replaced with the gravity hoppers shown at the right.





System which saves approximately 70 per cent of the man hours formerly necessary for the fumigation. This is a piped system which automatically applies a measured amount of fumigant to the machines and spouts in the milling system. The operator simply presses a button when everyone is ready to leave the plant and the machine automatically goes through the application cycle. The equipment is manufactured by the Arrow Engineering and Chemical Company, Inc., Flint, Michigan.

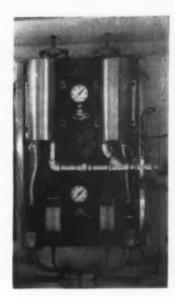
Milling Equipment

Some of the machines used in the milling process for separation of milling stocks had previously been installed with small conveyors under each machine for gathering and distributing the material separated. These were removed and replaced

Interior of main control unit of the Arrowcide automatic fumigation system. This installation saved approximately 70 per cent of man-hours formerly necessary to apply fumigant to machines and spouts in the milling system.

with gravity hoppers as illustrated. This saved power and maintenance, and removed a possible source of infestation because it was hard to clean. The power savings was approximately 10 hp per hour for each of the two milling units.

A great many other general minor improvements were made and these are well illustrated. As an example, new type elevator boots manufactured by the Southwest Mill & Industrial Equipment Co. of Oklahoma City, Oklahoma, were installed throughout the plant, simplifying building maintenance.



A Tip on Steam Trap Installation

OCCASIONALLY the question arises as to the correct relationship of installing steam traps and other subordinate equipment from the discharge point of any steam-using equipment to the return main.

The strainer should be first, so there will be no dirt getting to the trap and return line. In the blowdown connection of the strainer either a plug or a nipple and valve should be installed. If there is not much room, a plug may be the only alternative but if the line is liable to be very dirty it should be arranged so the nipple and valve can be used. It is much easier to blowdown the strainer by simply opening the valve rather than trying to get your wrench in a tight spot to remove a plug.

The trap is next so it is still as close to the equipment as possible in order to do its job effectively. An effective steam trap must remove air and condensate as quickly as possible from the steam-using equipment and yet prevent the

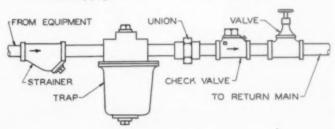
escape of live steam. Of course, the ultimate purpose of this procedure is to bring the equipment up to temperature as quickly as possible and keep it there. When the trap is close to the equipment it can perform its functions directly and not waste its effort keeping non-productive piping hot.

The center is the best place for the union to facilitate the easiest removal of anything from the line. The check valve should be next to make certain that no condensate will be backed up into the trap or the main piece of equipment.

A globe, or gate valve, in the line is important in case the check valve wears out and also for double protection if the line is to be closed for any length of time.

To help have time when servicing is necessary, it is good practice to have complete replacement units on hand and spare parts for each unit. Even new nipples, cut to length, are handy in case the ones in the line are frozen or stripped. It is much easier to replace the old units with new ones when trouble occurs and repair the old ones at your bench when you have more time.

The V. D. Anderson Co. believes this is the most efficient way of hooking up this section of piping.



The Plant Electrician Must Have a Program

Planning, Scheduling, Training and Working

THE amount of maintenance required to keep up electrical equipment depends on the nature of the plant or type of industry, so I will first describe my own job. I have been Chief Electrician for the Chemical Division of Tennessee Products and Chemical Corporation for 3 years and am located at Chattanooga in the main chemical plant area. A Fine Chemical Plant; BHC Plant, Insecticide; and a SR-406 Plant, Insecticide, are located in this area.

In these plants we have in use some 600 motors, in size ½ hp to 125 hp. Around 50 spare motors are kept in stock, for plugging vital holes in operations.

We maintain these plants with a maximum of 4 electricians, working only a day shift of 40 hours per week. This could not be accomplished without careful planning and scheduling.

1—We keep on hand a well stocked supply of spare parts. The storekeeper and I work together on ordering and inventorying spare parts. When parts have been used to a set level, a set amount of these parts are ordered.

2—Every piece of electrical equipment is numbered with a shop number. All the technical data such as size type, voltage, etc., are written down and filed away for future reference.

The card for a certain motor includes information similar to the following: Location—BHC Flaker, hp-5, Type CSP, Class B, Frame 254, Style 1462738, 60 cycle, Serial 5002, 220/440 volts, 14/7 amp, 1750 rpm, 55 C rise continuous. Shop #51, spare—in warehouse.

3—The equipment is checked for repairs and a note is made of what needs repairing. Next, a work order is written up on a job sheet, then passed on to one or more of our electricians, according to priority of the job. Jobs which may slow down production are given top priority.

4-We keep what is known as a preventive maintenance list. That is, a periodic check of some equipment and controls vital to our operations.

- A. Shop maintenance and plant repairs.
- B. Check motors in all plants, check oil, grease, bearings and overall conditions of motors. A check of load conditions is made every 3 months.
- C. Check mercury switches, pressuretrols and temperature controls on refrigeration compressors.
- D. Check plant lighting
- E. Check extension cords, hand lamps, and wall receptacle.
- F. Check ground lights, and control room equipment, breakers, transformers, capacitors, etc.
- G. Check telephones in BHC plant.

Every day has a certain amount of equipment set up for checking. The number of breakdowns we caught and repaired before they actually caused outages is surprising. This saved a lot of production and reduced our night emergency calls to practically none. During the past 6 months, we had, I believe, around 4 calls at night. I can remember taking that many in one night two years ago.

Scheduling and Planning

Too many foremen, master mechanics, and supervisors attempt to run their individual departments without careful scheduling and planning. Advanced planning can be accomplished by studying your equipment, your working hours, the size of your crew, and having an understanding with management. I have yet to see a job fail when it is operated from a well planned program. Working from a routine schedule or a well planned program you always know what is coming up next. This is



By B. K. HOBBS

Chief Electrician
Tennessee Products and Chemical Corp.
Chattanooga, Tennessee

sometimes interrupted by emergency breakdowns, especially where there is only a small crew, but once in operation for some length of time you can manage to take care of your routine work on schedule as well as your breakdowns.

When new jobs come from management to my shop, first I decide on, along with some of my men's ideas, the best plan toward installing the needed equipment. Then the storeroom is checked to see what we have on hand in the way of equipment, what will have to be purchased, etc. Then after selecting the men for this particular job, I spend my efforts toward seeing the job goes as planned.

Scheduling and planning require a good deal of paper work. I spend 50% of my time with a pencil, but have found out through experience alone, it pays off in a shop being run according to plan. You save man hours and money as well as yourself a lot of headaches.

Organization of Crews

This can at times be a difficult problem. Some foremen build up a good crew in a short time, some never do have a dependable crew. First, I never employ a man if I know he won't or can't be a part of the crew we are building. After selecting the men who are to make up a crew we find out what we can about these men, their likes and

dislikes. After a little conference with these men in which I explain as well as I can the plant operations, and just what is expected of them, they are then taken through the plant and all the electrical operations are explained in detail. Like most plants, we have a breaking-in period for new men. The men are warned as to what could be dangerous to them. They are instructed not to get tied up in something they aren't familiar with or that may endanger their lives and men working around them.

During the breaking-in period, the new men are in company with older men on the job, who in turn are instructed to help with new members of a crew. There are lots of different varieties of work in maintenance. Some men like and excel in some of these, where on the other hand they neither like nor are very good at other phases of the work. I pick our men for certain jobs on that principle. It saves time, and the quality of the work is better. But while allowing for individualities and specialization, we try to train our men to do all types of work, because you never can tell when they will be called on to do jobs they dislike, but must be familiar with.

Make a crew of men feel that they are a part of an organization. Show them their importance to the job. Shoot straight with them, and don't make a lot of promises you can never fulfill. When on a job ask for their ideas. Some may be better than your own.

A good crew needs good tools. Work can always be made somewhat easier and simpler with the right tools.

We have followed this policy for several years, and have never failed to form a reliable crew from it. A good foreman is a man with a dependable and efficient crew of men.

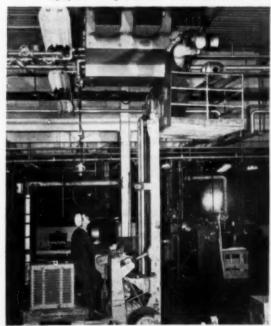
THE TEMPORARY REPAIR PROBLEM is a constant strain on the maintenance organization. Check page 65 for the Editors' comments on this important subject.

Platform Trucks Aid Maintenance

THE value of the fork trucks in materials handling is so great that secondary uses such as maintenance tend to be overlooked.

Because maintenance is normally scheduled to avoid conflict with production, however, fork trucks are likely to be available for maintenance when needed. They are particularly advantageous for high-level work—serving both as a lifting device and work platform.—Courteey, The Yale & Towne Mfg. Co.

At left, a lift truck with portable platform is used to repair and replace equipment in the heating and ventilating system. At right, the more conventional use for cleaning and replacing overhead lights is shown.





SHOP WELDING

Planning for Maintenance Welding

By J. E. DURSTINE

District Engineer
The Lincoln Electric Company
Birmingham, Alabama

ANYTHING can and does happen in plant maintenance work. Therefore planning for welding presents some difficulties because of the wide variety of jobs that can be done with welding equipment. It would be impractical to outline recommendations to fit all of the varying conditions, so this discussion is confined to the general application of machines and electrodes. Good planning in each plant must consist of applying this knowledge of equipment to what is expected in the way of welding jobs.

Men doing welding should know something about metals, how they identify them and their weldability. Good all around welding experience should be in the man's background as he may be called to weld in any position, under extreme conditions and to code specifications. Knowledge of elementary welding metallurgy and simple blue print reading is another useful asset. Some skill in handling a cutting torch is also essential.

Welding Machines

The chief quality to look for in a welding machine for general plant work is flexibility. In general, DC welding machines will have greater flexibility than AC. This is because some electrodes are not suitable for operation on AC. The set should be readily portable, and if a large amount of fabricating or repeir work such as surfacing is expected, a welding station should be set up in the maintenance department



A cone adapter for uncoiling sheet steel is built up by hand welding using an all-purpose tool steel electrode to resist the severe metal to metal friction of the service conditions. Job done by Acme Fishing Tool Company of Parkersburg, West Virginia.

with a stationary welder. A machine with a NEMA rating of 200 amperes will provide adequate capacity for all general plant work. A larger machine will be needed for welding heavy plate or for large surfacing operations.

Machines rated at 200 amperes designed especially for maintenance or light production work are available in compact upright frames that are lighter and more readily portable than standard 200 ampere production welders. If welding is to be done in areas fairly far from a power supply, the gasoline engine driven welder will save a great deal of time that would otherwise be lost in making power connections. Special light-weight models are available for maintenance work.

Metals to be welded must frequently be formed, cut or otherwise prepared prior to welding. A cutting torch, saw, shear, brake and drill press will be useful depending on the nature of the plant operations.

Electrodes

Electrodes should be stocked in types and sizes that will be needed to meet demands of the jobs to be encountered. A few general recommendations with specific illustrations will serve as a guide when selecting an electrode for a particular job. In addition to the type of metal being welded, the following factors determine the type of electrode:

- The position in which the work must be welded.
- 2. The thickness of the metal being welded.
- 3. The fit-up of the work.
- Class of work, i.e., whether deep penetration or surface quality is the chief essential.

Electrodes are manufactured for welding different types of metals and to meet the above needs.

Steel

While a wide range of metals will be encountered in maintenance welding, mild steel will be encountered most frequently. Mild steel is used in machinery and structures where conditions of extreme wear or stress are not present. This material, along with medium and high carbon steels, can easily be identified by the familiar spark test under a grinding wheel. Low carbon steel throws off white sparks in long thin forked shafts. The higher the carbon content, the denser and shorter the shafts become, breaking into numerous small sprigs. Every maintenance department should make up a set of samples of known carbon content so that unknown metals can be checked by comparing the spark with those of the known samples.

The following electrodes (A.S.T.M. and A.W.S. standard numbers) should be on hand for welding steel:

E6010—use where deep penetration is needed for strength joint; for structural welding especially in overhead and vertical position. First choice for a general purpose maintenance electrode.

E6012—where build-up rather than deep penetration is desired; deposits machine more easily than E6010; good where fit-up is poor.

E6013—special sheet metal electrode in small diameters.

E6016—this is a low-hydrogen type electrode and is a favorite of maintenance departments because it can be used safely on mild steel, medium, or high carbon. Eliminates necessity for preheating of steels subject to hardening and cracking. Gives high strength, ductile weld.

E7010 — use where high tensile strength weld is desired; a general purpose electrode for welding low-alloy high tensile steels with under .30 cashon.

High carbon steel can be welded satisfactorily with an E6010 electrode if the metal is first preheated to a blue heat of about 450 F. This temperature should be maintained during welding, and the weld then be allowed to cool slowly to room temperature. Preheating can be eliminated, however, by using the low-hydrogen type electrode, E6016.

Cast Iron

In addition to electrodes for welding steel, the maintenance department should have electrodes for welding cast iron. Two types should be carried. An electrode made with a steel core wire should be used where the weld will not be subsequently machined. For welds in cast iron on which some machining must be done, an electrode with a nickel core wire should be used. The latter type is more expensive and its use should therefore be limited to jobs where machining is required.

Procedure for welding cast iron varies depending upon the casting and the requirements of the job. All procedures stem, however, from the fact that when cast iron cools quickly from slightly below the molten state, it becomes extremely hard and brittle and will crack readily. Caution should be observed in maintaining a slow uniform rate of cooling in the casting or in the area affected by welding heat. Short beads should be used in welding and each bead should be allowed to cool so that it can be touched with the bare hand before applying another bead. Preheating will also help to maintain a uniform rate of cooling.

Non-Ferrous Metals

Non-ferrous electrodes in general will not be needed in the maintenance weldery unless the plant has a large amount of non-ferrous metal in its equipment. Aluminum or bronze electrodes can be stocked if there is a need for them. The same is true of stainless steel electrodes.

Surfacing

Surfacing is an important maintenance welding operation which can only be treated briefly here. It is a rapidly developing field and is one which offers great opportunities for creating important plant savings. If the industry being served is one in which large pieces of equipment or small pieces in large quantities are worn, it may be profitable to install automatic or semi-automatic welding equipment. Steel mill rolls or crusher rolls are parts successfully surfaced automatically. Many tractor parts are reclaimed this way. The first cost of equipment is relatively high compared to regular hand welding equipment, but the first cost is soon recaptured from the savings.

The recommendations for electrode stock are more difficult for surfacing operations than for regular welding. These electrodes have not been standardized and the conditions under which wear occurs and for which surfacing is applied vary greatly. A thorough analysis of each job to be done must be made and electrodes stocked accordingly.

The choice of correct surfacing material must be made considering:

- Service required of the part to be surfaced.
- Service conditions under operation.
- Physical properties of the base material.
- 4. Size and shape of the part.
- 5. Finish required on the part.

Wear usually results from more than one cause; it is usually a combination of abrasion impact and corrosion. It is necessary to evalu-

This 100" back-up roll for a semi-continuous plate mill is being reclaimed by building journals up to size with automatic hidden arc welding. Automatic welding equipment can make unusual savings where the nature of the work justifies its installation.

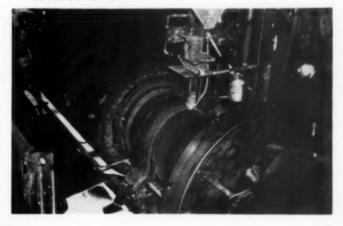


Table 1—Recommendations for Sheet Metal Welding

Electrode Size, Amperes, and Volts - F-Flat Position; V-Vertical; O-Overhead

| Type of Welded Joint | | 28 gs | | | 18 ga | | | 16 ga | | | 14 ga | | | 12 gn | | | 10 gn | | | 8 ga | |
|---|--------------------------------------|------------------------------|--------------------------------------|--|--|--|---------------------------------|---------------------------------|---------------------------------|----------------------------------|----------------------------------|----------------------------------|--|--|---|--|--|--|--|--------------------------------------|--|
| | F | ٧ | 0 | F | ٧ | 0 | F | v | 0 | F | v | 0 | F | V | 0 | F | ٧ | 0 | F | V | 0 |
| ELECTRODE SIZE | | | | | | | | | | | | | | | | | | | | | |
| Plan buit Lap Fillet Corner Edge | 3/32 3/32 3/32 3/32 3/32 | 3/32 3/32 3/32 3/32 | 3/32 3/32 3/32 3/32 3/32 | 3/32 3/32 3/32 3/32 3/32 3/32 | 3 32 3 32 3 32 3 32 3 32 3 32 3 32 | 2 32 3 32 3 32 3 32 3 32 3 32 | 1/6 1/6 1/6 1/6 1/6 | 1/6 1/6 1/6 1/6 1/6 | 1/6 1/6 1/6 1/6 1/6 | 1/6 5/32 1/8 1/8 1/8 | 5/5 5/32 1/5 1/6 1/8 | 1/6 5/32 1/6 1/6 1/6 | 5/32 5/32 5/32 5/32 3/16 3/16 | 5/32 5/32 5/32 5/32 5/32 5/32 | \$ 32 \$ 32 \$ 32 \$ 32 \$ 32 \$ 32 \$ 32 | 5/32 2/16 3/16 2/16 2/16 2/16 | 5/32 2/16 5/32 5/32 5/32 5/32 | 5/32 5/32 5/32 5/32 5/32 5/32 | 3/16 2/16 3/16 3/16 3/16 3/16 | 5/32 3/16 6/32 5/32 5/32 | 5/32 5/32 5/32 5/32 5/32 5/32 |
| WELDING CURRENT AMP | ERES | | | | | | | | | | | | | | | | | | | | |
| Plain butt Lap Fillet Corner Edge | 30° 40° 40° 40° | 30° 40° 48° 40° | 30° 40° 40° 40° | 40° 60° 60° 60° | 40° 60° 40° 60° | 40° 60° 40° 60° | 70° 100 70° 90° 80° | 70° 100 70° 90° 80° | 70° 100 70° 90° 80° | 85° 130 100 93 110 | 80 130 90 80 80 | 85° 130 85 75 80 | 115 135 150 125 145 | 110 120 140 110 110 | 110 120 120 110 110 | 135 155 180 140 150 | 120 130 150 130 120 | 115 120 130 125 120 | 198 165 180 175 180 | 130 149 160 130 120 | 120 120 130 125 129 |
| WELDING VOLTAGE | | | | | | | | | | | | | | | | | | | | | |
| Place built up fillet Darner Edge | 18 21 21 21 | 18 21 21 21 21 | 18 21 21 21 21 | 18 22 21 24 23 | 18 22 21 24 23 | 18 22 21 24 23 | 29 25 27 24 25 | 29 25 27 24 25 | 29 25 27 24 25 | 29 25 25 24 27 | 29 25 24 28 26 | 29 25 24 25 26 | 25 25 25 24 28 | 26 26 24 28 28 | 25 25 24 26 26 | 25 28 25 24 28 | 27 26 24 28 27 | 25 25 24 26 26 | 27 28 25 27 28 | 27 26 24 28 27 | 26 25 24 26 27 |

Note: * Electrode negative, work positive.

ate the relative importance of each of these wear factors and select a material for surfacing accordingly. It is generally true that protection against all factors cannot be provided equally in a single material. Abrasion resistance is gained at the sacrifice of impact resistance. The electrode chosen must be one that meets best the demands. If both impact and abrasion are present in fairly equal amounts a good allaround semi-austenitic type of material can be used. Otherwise a

selection of either abrasion resistance material or impact resistance material must be made.

In addition to the type of wear, the way in which the parts are worn should be considered. It may be desirable to protect both parts or only one part of a machine where metal to metal friction occurs. It may be necessary to surface with a relatively soft material so that an irreplaceable harder part will not be worn out. A thin deposit may be best so that a self-sharpening edge

is created. In some plants the maintenance department may be called on to rebuild cutting and forming tools in which case the whole field of tool steel must be examined to get correct electrodes for the job.

In general, an electrode is available to match any tool steel, but this is frequently not necessary. An all-purpose tool steel electrode is available which can be subjected to a wide range of heat treatments and with which the surface qualities of many different tool steels can be matched. This electrode greatly simplifies the stocking problem and greatly reduces the cost of doing this job.

Although the American Welding Society has not as yet standardized surfacing materials, most electrode manufacturers have excellent literature on the subject and are in a position to offer help if questions on application arise.

Sheet Metal Welding

Sheet metal welding is another frequently used maintenance skill. Containers, bins, tables, shields, guards and tanks are readily tailormade to do specific jobs. In welding sheet metal, normal procedures are used with special attention being given to control of distortion. Speed of welding, selection of proper joint, good fit-up, downhand welding, proper currents, number of passes, sequence of beads and

Welding stations in maintenance departments can be shielded with easily adjusted screens made of sheet metal. The welding machine being used here is a special 200 ampere unit which can be readily moved about the plant or plugged in at the welding station. Operator is welding a flange for a stack mode of ten gauge sheet metal.



good clamping fixtures are important in good sheet metal welding.

- Speed should be the fastest consistent with good penetration and desired appearance.
- b. Lap joints simplify fit-up problems and minimize burn-through.
- Good clamps and fixtures insure fit-up and resist forces of distortion.
- d. Expense to get good fit-up is worth the money it saves in increased welding speed and minimizing burn-through.
- e. Fewer passes mean less applied heat to cause distortion.
- f. Balance welding beads by sequence of application so that forces of distortion counteract each other.

The recommended electrode sizes, welding current and voltages are given in Table 1.

Machine Repair

Frequently, replacements for broken machine parts are no longer available or delivery is slow. Maintenance welding makes one of its major contributions to plant operation by facilitating the making of replacement parts. This is especially true of old castings which fail in service. They can easily be duplicated in steel at a fraction of the cost of a new part.

Structural Welding

Making structures of all types is another important use for welding. Frequently simple structures such as tool cages, motor platforms, guards, sheds, etc., can be made from available scrap. Important load bearing members such as crane jibs should be designed, but rule of thumb can be used in many instances. By welding, pipe can be used to good advantage for columns and other structural members. Table 2 gives the length of fillet weld required to replace rivets. An E6010 electrode should be standard for all structural welding.

Containers

Tanks, pressure vessels and piping frequently require welding in the plant. Welding on any container which will be under pressure should be done to code specifications. Only qualified welders should be permitted to do such work. Many containers do not have to be welded to

Table 2—Length of Fillet Weld Required to Equal Rivets in Strength

| | Rivet shear | Length of filtet welds (to nearest \$\frac{1}{2}\$ in.), "fusion code" (structural)," shielded are welding | | | | | | | | | | | | | |
|-----------------|--|--|--------------------------------------|---|--------------------------------------|--------------------------|--|--|--|--|--|--|--|--|--|
| Rivet diam, in. | hayne @ 17,000 | 1/4 in. fillet, in. | % in Milet, in. | 3½ in. fillet, in. | U ₂ in, fillet, in. | % in. fillet, in. | | | | | | | | | |
| 12 | 2,990 4,600 6,630 9,620 11,700 | 11/2 21/4 3 41/8 61/4 | 11/4 13/4 21/2 33/6 41/6 | 11 ₀ 11 ₇ 21 ₀ 27 ₀ 38 ₀ | 11/4 11/4 15/4 21/6 23/4 | 136 136 136 214 | | | | | | | | | |

Note: * AISC value for rivet in shear is 15,000 pol; for wold in shear it is 13,000 pol (American Institute of Steel Construction), 1/4 in, is added to calculate length of fillet.

specifications, however, and in such cases normal welding procedures are used.

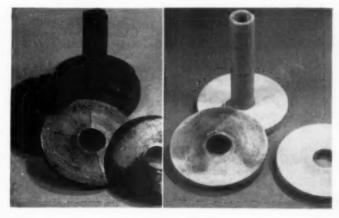
Welding makes permanently tight connections, gives greater strength and rigidity, simplifies design, is easier to insulate and is more efficient due to elimination of internal projections. Work to code specifications may require an E7010 electrode or possibly E10010 if extra strength is needed. Normally an E6010 electrode will do the work satisfactorily.

If very much piping work is anticipated, the maintenance department should be equipped with the proper tools for laying out pipe connections and with good cutting equipment for preparing the joints. The making of pipe joints is a special skill.

Use of Silicone-Glass Laminates Extends Insulator Service Life

Electrical maintenance men in a Kentucky chemical plant specified cottonphenolic spacer disks and tubes to insulate the knife-switches on a 45,000 amp graphitizing transformer. Operating temperatures ranged from 400 F to 500 F, converting the organic insulators into the illustrated charred, cracked, shrunken conductors in less than 30 days. Not only were new spacers installed monthly, holding up production for an entire day, but their constant shrinkage done meant that the switches had to be tightened daily.

Eleven months ago insulators made of laminated glass cloth and Dow Corning silicone impregnating resin were installed. The switches have not required tightening since. The silicone-glass laminates shown at the right, are still in excellent condition. Company engineers estimate their total service life will extend over several years. Already they have repaid their original cost many times over in increased production and reduced maintenance and down time.



OPERATING TROUBLES

Shake-Down Problems and Solutions

None of these troubles are rare. And yet, in varying forms, they plague plant operators year after year. These examples will show the wisdom of looking for a commonplace remedy when the ailment seems obscure.

By MEN IN THE PLANTS

The editors asked a few experienced aperators to tell about simple problems that looted big at the time. To avoid possible embarrassment, names of men and plants are omitted.

Voltage Regulator Misbehavior

Recording voltmeter showed variations of a few per cent from time to time during the day . . . checking accuracy of voltage regulator with a recording meter on high voltage box . . . generator voltage regulators refused to stop hunting.

Instead of remaining constant as regulated voltage should, the reading on the recording voltmeter showed variations of a few per cent from time to time during the day. Temperature and frequency changes were first considered, but then eliminated as probable causes of the variations.

It was found that the recording voltmeter was reading from one phase, while the regulator was regulating a different phase. When both were changed to the same phase, the effect of unbalanced load on the voltages of the different phases was eliminated and voltage readings became constant.

Another case that cannot be so solved, however, is one in which the generators supply the high voltage station bus through individual generator transformer banks, and the banks are deltawye connected.

In one case it was impossible to check the accuracy of the voltage regulator with a recording meter on the high voltage bus when the regulator controlled the voltage of one phase of the 2400 volt generator in delta connection. The 12,470 volt potential transformers on the high voltage bus were delta connected, and none of the three cornected, and none of the three cor-

responded to the regulated phase of the generator.

In reality, the high voltage phase of the power transformer bank was supplied by two of the low voltage phases. Other considerations had dictated the use of delta connected potential transformers on both high and low voltage sides of the delta-wye connected power transformer bank. As a consequence, there was no way to match phases as being the same on the high voltage and the low voltage side, and unbalanced load and voltage made verification impossible.

Another baffling problem is to have generator voltage regulators refuse to stop hunting when the power station supplies solely a distant substation, and the regulators have line drop compensation to maintain a constant voltage at the substation load center.

In an installation of this kind, the regulators would not settle down for synchronizing. It was discovered that the compensators were supplied by the outgoing current from the plant, and thus changed the regulator's compensation voltage each time the generator would drift in and out of synchronism prior to closing the generator circuit breaker. The solution did not appear until after many efforts to dampen the regulator swings. Now, since the cause of the trouble is known, the operators disconnect the line drop compensator during synchronization.

Oil Lines Plugged

In starting a new small turbine driven water pump, we found the bearing at the thrust end of the turbine running hot and the thrust end vibrating badly. After checking oil pressure and oil reservoir level, we were stumped for an answer, since everything seemed normal. We tried the second run with the same net results.

We then disassembled the bearing and found half of a man's shirt sleeve in the bearing oil sump. Thinking that this time we surely had the answer, we re-assembled the bearing and tried the third run. The result was the same. We then took off all oil piping and found a wooden plug in the pipe. The plug allowed some oil to get by, but not enough.

Improper Boil-Out Deposits Silica

A NEW large watertube boiler was being prepared to go on the line for the first time. After field assembly had been completed, the boiler was filled with water with about 125 lb of caustic soda, 35 lb of Calgonite, 15 lb of sodium sulphite and 12 lb of a detergent. It was boiled for about 48 hours at about 50 lb pressure with a slow wood fire. This was done to remove any oil remaining from tube rolling.

After the boiling was completed, the boiler was flushed out, refilled and put on line. In two days, a number of waterwall tubes overheated and failed.

Investigation following the failure disclosed that there was a 1/32 in. silica scale adhering to the water side of the tubes. It was then learned that when alkalinity is low during the boil out period, due to reaction of the Calgonite and oil, silica in the Calgonite becomes less soluble and it will deposit on the heating surfaces.

It is recommended that the alkalinity be checked every hour during the boil-out process. If it drops below B reading of about 18 ml, more caustic soda should be added.

Putting a New Air Compressor on Line?

PLACING large new air compressors in operation can provide plenty of headaches. Operate the unit for several hours without load to allow the bearings and moving parts to work in properly. During this period, the compressor should be stopped frequently so that the crank shaft and cross head connecting rod bearings can be checked.

If a large V-belt drive is employed, it should be checked during this period for belt stretch. It will probably be necessary to tighten the belt several times to allow for the initial elongation. This procedure should also be followed, if the belts are removed from operation for any length of time and then reinstalled, such as following internal inspections.

Tube Failures From Burner Installation

THE plant engineer decided to install oil burners in a large two-drum bent tube watertube boiler designed for stoker firing. The stoker was left in place and covered with firebrick. The oil burners were installed directly above the stoker, firing across the short dimension of the furnace toward the slag screen. Had the manufacturer of the boiler pro-

vided it with oil burners, they would have put them in one end so that they would be firing in the long dimension of the furnace parallel to the drums.

The installation with the short furnace of only about 12 ft soon resulted in repeated tube failures. Flame from the oil burners blasted the slag screen tubes at a terrific rate with fire clear back in the second pass because there was insufficient time for complete com-

Rather than go to the expense of altering the building to permit side firing, the burners were provided with registers in veins. The tips were changed and the result was a short swirling fire rather than the long shot firing that was damaging the tubes.

Boiler Installation Troubles

Purge all connecting piping and tubing between boiler and combustion controls and meters . . . feedwater control thermostat trouble . . underfeed type stoker notations . . boiling out with main steam valves . . . checking for leaks.

DURING recent years, we have installed five new water tube boilers of different types, and have found it most important to proceed slowly during the stages of placing the boiler on the line.

All connecting piping and tubing between the boiler proper and its combustion controls and meters should be carefully purged of all foreign materials that might block or interfere with these connections. In one instance, we experienced troublesome "hunting" of a balanced float draft regulator controlling a boiler damper. In spite of all our efforts to adjust the regulator, it continued to hunt up and down, varying the air flow. We finally discovered that a connection between the regulator and the boiler setting was partially blocked and had been since installation. Upon clearing this obstruction. the regulator operated quite satisfactorily.

It is equally important to purge connections to meters so as to prevent foreign materials from passing into the meter mechanism causing damage thereto. We experienced this, but luckily without serious damage.

Trouble is frequently experienced with new feedwater control thermostats due to the failure of the operator to "blow-down" the water connection to the thermostat so as to remove the cold water and to thoroughly heat up the tube. This can happen on old in-

stallations where the boiler is shut down for several days and is being placed on the line again.

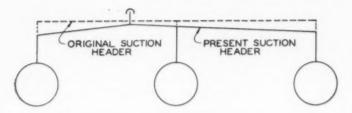
If underfeed type stokers are being installed, check the distribution of the coal along the stoker retort before putting any fire on the grates. We recently started up a new boiler without doing this. Although the push rods and shoes for distributing the coal had been assembled at the stoker manufacturer's plant, we found that this distribution was entirely incorrect. The boiler was operated for two days using different types of coal before we finally decided that the factory settings must be incorrect. It then took another two days to find the proper adjustment of the shoes and push rods to secure the correct coal distribution.

We strongly advise against boiling out new boilers with the main steam valves. This can easily result in a deposit of chemicals inside the valve that would obstruct normal operation. This is particularly true with non-return valves. A blank flange mounted on the steam outlets will prevent this difficulty.

After the main steam valves are installed, open them slowly before the boiler reaches full operating pressure. This allows the new valve and piping to heat up slowly and prevent possible damage. It will also quickly show up any leaks in the piping and valve installations. A gasket unintentionally omitted, for instance, or one that was not properly tightened down would show immediately before the cutting action of higher pressure steam could ruin the flange face.

(More "Shake-Down" next page)

Shake-Down Problems and Solutions (continued)

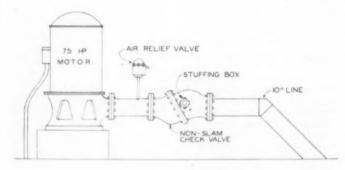


Suction Header Improved

Situation—Three boiler feed pumps were installed with common suction header as shown by dotted line. At rated load, two pumps were in operation with one pump a spare.

Trouble—Upon start-up of pump a severe hammer frequently occurred, even though the pump was gradually brought to operating speed by a hydraulic coupling. A check of the positive suction head and velocities indicated they were well within the allowable limits used in design.

Solution—Numerous suggestions as to the cause and possible means of eliminating the hammer were considered. But the hammers were not stopped until the horizontal sections of the headers were sloped toward the pumps. The amount of slope is only about 1 in. per 10 ft, but the hammer has not occurred since.



Check Valve Slammed

W E have a considerable number of pumps in our plant and some of them have "non-slam" valves. One 1400 gpm pump, 10 in. pipe, and a head of about 20 ft, was recently put into service. When it was shut off, there was a terrific impact and the large pipe raised up, damaging valves and fittings and lifting motor and pump slightly. Other applications of these valves gave no such troubles, even on high head pumps.

It was noticed that the bump occurred quite a little while after the pump was stopped. We decided that the valve disc was hanging open and then closing suddenly after the water flow was well reversed. Examination indicated that the nuts holding the stuffing boxes on the disc shaft were very tight. Loosening them cured the trouble and the valve works properly.

Look for a commonplace remedy

Reversed Air in Cooling Tower

Fan was running counter-clockwise and pushing air through the tower instead of pulling it through toward top outlet. Power demands of municipal station were met upon correction of operator's error.

MOST industrial water-cooling towers are of the induced draft type, and during normal operation the induced draft fan moves air through the tower from bottom to top. Ice removal in cold weather may be effected by reversing the direction of rotation of the motor driving the fan, thus blowing warm air and vapor out through the louvers.

At a municipal Diesel electric generating station the direction of fan rotation was reversed by one of the operators in February, 1950 for ice removal. That operator went home soon thereafter and the fan continued operation in reverse. Despite the decreased cooling efficiency of the tower, the Diesel engine jacket water was cooled sufficiently to meet the less-thancapacity power demands during the summer of 1950 and the winter of 1950-51.

By the latter part of May, 1951, the power demands had increased and the engine would not take the maximum load without overheating. The cooling tower was blamed, and it was thought necessary to purchase additional cooling tower capacity. A tower sales engineer was called in for consultation. He inspected the existing equipment and observed warm air coming out of the louver openings. His suspicions were immediately aroused and he went to the fan deck of the tower where he noticed that the fan was running counterclockwise and pushing air through the tower instead of pulling it through toward the top outlet.

The fan rotation was reversed and within an hour, the cooling performance was increased, the engine ran cooler, and the power output was increased from 3000 to 4000 kw. The power demands were met and the tower representative lost a possible sale.

Debris in Boiler

A NEW watertube boiler provided with waterwalls was started up recently and it had been on the line but a few hours when a serious rupture occurred in one of the waterwall tubes. Examination after the boiler had been cooled down showed that sixteen of the eighteen tubes in the right hand waterwall had been badly overheated and bulged to the point where expensive repairs were necessary.

The fact that all of the tube failures occurred in one waterwall immediately led to suspicion that there was an obstruction in the downcomer supply circulating tube. A tennis ball was dropped down through the tube and it failed to go through. Finally with the aid of a high pressure stream of water, the tennis ball and a hand full of waste came through the tube. Obviously, the waste had dropped from the pocket of a workman in the steam drum and the boiler was closed up without anyone ever noticing it.

The object lesson is clear. Always double check the interior of a boiler before closing the manhole.

Initial Belt Stretch

ATTENTION should be given to the initial stretch of rubber covered conveyor belts. Not long ago, we installed a 20 in. wide belt to move coal 200 ft up an incline of 19 degrees. This belt was equipped with a stretch take-up pulley and weights. Even though the belt was stretched as tightly as possible on installation, it continued to stretch rapidly during the first few hours of operation under load.

The stretch take-up pulley dropped rapidly to allow for the stretch and almost allowed the belt to be cut by supporting steel work underneath. Fortunately, the master mechanic realized the situation and shortened the belt before serious damage could occur. It was necessary to shorten the belt several times during the first few months of operation before the initial stretch was removed.

Think You Had Troubles? Listen to Mine!

Soot Blowers—The soot blower design, construction, installation and everything else was perfect. Only, two people started measuring from two different places and each jet made a perfect bullseye on the nearest tube.

This is not good practice.

Who's Checking What—We had a bunch of lads fresh out of school on this deal and we figured we should get some work out of them, so we put them to taking turns working the Orsat. We figured we would average the results, but this soon looked like a bad idea because inside of a few minutes the kids gave us CO₂ readings from about zero—on up.

While we were figuring out some juicy sarcastic remarks, we found that somebody else was monkeying with the automatic combustion controls while the kids were taking readings. So on a new job it is a good plan not to introduce too many variables into the problem at once, and if possible keep the variables down to one at a time.

Remotely Controlled Valve—A remotely controlled valve was working in a way very remote from what it should. This valve was controlled with an electronic servo system. There was a little dial in one place and the valve was in another place. If you moved the dial a little bit the valve was supposed to move the same little bit. Only it didn't. If you moved the dial off zero the valve went all the way and wouldn't come back. Then you had to crank it back by hand.

After a while we found the wiring was backwards, that is, it was 180 degrees out of phase. The electricians told us that "since it's a two wire a-c system it don't make any difference which way the two wires are hooked up."

Wrong Connection—Our boiler has a flame failure detector among other things in the interlock system. This is so you don't pump your furnace full of fuel if the lighter doesn't light it right away. The induced draft fan was started up and everything was fine except every time we lit-off, the I.D. fan stopped and then the fuel stopped. There was nothing wrong except a couple of connections on a contactor.

The lesson is that if there is an unused set of contacts on a relay or contactor, make sure the right set is hooked into the circuit.

Smoke Detector—This smoke detector was no homemade job but a standard unit that was working swell on lots of other jobs. After we got the boiler going good it came time to turn on the gadgets. This thing has a knob on it to twist for sensitivity. It's got a phototube, a light, and other stuff too. The knob is the adjustment to set a minimum to make the bell stop ringing.

But even if a faint haze in the stack got only a little hazier the gong went off. After a long hunt we found a resistor in series with the exciter lamp. This makes the light shining on the phototube dim just as if there were smoke in the stack. We shorted out the resistor and everything was fine. The maintenance electrician said he always put a resistor in series with "pilot" lights or else put 220 v lamps in 110 v pilot circuits because "they last a lot longer and you don't need them so bright anyway."

(For more Plant Troubles, turn page)

Venting Hydrogen Cooler on Large Generator

This power plant operator was misled — he realized that something might be wrong with the pipe between the coolers and valves or point of venting. He opened the valve momentarily and had a flow of water, which was in the pipe. However, after trying vents the second time, he found an air lock.

AT approximately 7:30 pm the cold gas on the collector end of our large hydrogen cooled electric generator began rising in temperature. Also stator phases began rising in temperature. Operation of the generator at this time was at full load and at 51/2 lb machine gas pressure. Inlet water to generator coolers was 80 F and outlet was 92 F. The indicating machine gas temperature was 33 C. This temperature did not change when the cold gas on the collector end of the generator began rising. Neither did it change any time during the time the cold gas temperature was up, which was about 30 minutes until the trouble was found and corrected

Water to all coolers was throttled by one valve in the inlet main, and was throttled low at this time.

Operator Misled

Due to the piping arrangement, the coolers on the turbine end of the generator were taking all the

water because of least resistance in flow. However, the main reason for the temperature rise was that the coolers on the collector end of the generator became air bound. There is about 15 ft of 3/8 in. pipe between the coolers and the valve or point of venting. This pipe being full of water, the operator was misled in his venting; when he opened the valve he had a flow of water which was in the pipe. However, after trying vents the second time. it was found that the coolers had air in them. That, along with increasing flow of water through the regulating valve, brought temperature back to normal.

The rise in cold gas temperature on the collector end was approximately 16 C on #5 point and 20 C on #6 point of the recorder. This was about 5 C above the hot gas temperatures.

The rise in hot gas temperatures was from 1 degree to 4 degrees above normal.

The rise in phase temperatures was from 2 to 9 degrees C. The highest recorded phase temperature was 79 C.

Since the above experience, the equipment has been operated satisfactorily with all vents on the generator coolers open at all times.

Compressors Often Misbehave

Holes Didn't Match:

In starting a 15 x 10 Ammonia booster compressor the bearing at the motor end of the compressor heated excessively. Upon opening the access to the compressor crank case, we found the thrust surface of the bearing beginning to gall. Since the compressor is run by a 100 hp engine type synchronous motor, we immediately thought that the rotor and stator were not properly set so that the motor in attempting to find the magnetic center was causing the shaft to pull back against the thrust surface. We also investigated the lube oil pump end to see if the lube oil by-pass port was drilled. It was! Reassembly and another run gave

us the same results. High lube oil pressure and terrific thrust.

A factory representative was called. He didn't know the answer! Since the oil pressure was extremely high and adjusting the relief had no effect on it, we again pulled off the oil pump and entire front end assembly. This time we found the trouble. The passage from the bypass of lube oil relief valve to the crank case was drilled from both the relief valve side and the crankcase side, but by trying to run a wire through this, we discovered that the two drilled passages didn't meet. We ran a drill into this passage, drilled out about 1/2 in. of metal, reassembled the machine and it has run successfully ever since.

Emulsification:

In starting another compressor the first week's operation ended with rather startling results. The oil in the crankcase emulsified to the consistency of heavy whipping cream. We drained the oil and checked every inch of the cylinders and casting as we suspected a leak in the water jacket. Nothing was found! We reassembled the machine and recharged with new oil. After only 14 hours of operation the oil again emulsified. We went through the same checking procedure under the supervision of a factory representative. Net result: the same, no trouble found.

We reassembled the machine and again charged with new oil. It has operated successfully for two years with no further trouble. What caused the initial emulsification? Where did the water come from? What was the remedy? We don't know! The machine came in as a pre-run factory tested piece of equipment containing the initial charge of oil and the entire crankcase under pressure, since it had been tested on Freon-12 and the residual Freon-12 had built up about a 30 pound pressure on the crankcase. We are still mystified!

Ice Fouled Purger:

In starting a large centrifugal Freon-12 compressor, having as a part of the unit an automatic purge unit consisting of a compressor, condenser, oil trap and intercooler, we used this purge as a vacuum pump to evacuate and dry the system before the initial charge of Freon. After a few days of operation on Freon the purge unit began to misbehave. This went on until it became impossible to operate the purge unit.

After two or three inspections and reassemblies, we tried to blow air through the continuous tube in the F-12 cooled condenser. Air wouldn't go through. By warming this small condenser and increasing the air pressure, we finally dislodged a couple of small pieces of ice. Once this continuous tube was free, we reassembled and began trouble-free operation.

THE SLAGGING PROBLEM IN BOILERS AND SUPERHEATERS

THE fouling of boiler and superheater surfaces by slag accumulations results when they are operated at high rates of output with certain fuels. In a number of instances the slag is of such a tenacious character that it resists the cleaning action of conventional sootblowers. The accumulated slag constitutes a serious problem because it increases draft loss by its bulk and causes a reduction in heat transfer by its insulating property.

Sheer necessity has prompted the development of supplementary cleaning methods. Of those which have been tried, washing with water seems to be the most effective.

Two methods of applying the water are in use, one employing large amounts of water and termed the "flooding method," the other using less water and called the "spray method."

Flooding Method

Generally speaking, the "flooding method" is applied only to cold boilers the settings of which have been designed to divert and carry off the water and prevent it from entering the furnace or damaging refractory parts. The flooding method accomplishes the cleaning in less time and by dilution it minimizes the corrosion hazard from the acidity of the effluent. The water under a pressure of 100 to 125 psig is applied by means of hose streams or preferably by long hand lances which when intelligently handled result in a more uniform and thorough cleaning. The cleaning is started at the top and the dirt is washed progressively downward. It has often been found desirable to wash in two stages. A preliminary washing is used to soften and disintegrate the slag followed by a second application to flush off the

By T. M. JOHNS

softened deposit. When properly executed the surfaces are found to be as clean as when new.

Spray Method

The spray method is applicable to hot or cold boilers. If the cleaning is done on a hot boiler it is advisable to take the boiler off the line, reduce the steam pressure to about 100 psig and maintain the pressure reasonably constant by a very light fire or by intermittent firing. If the fouled heating surface is directly over the furnace a strong updraft should be maintained by operating the fans at high speed. The water is applied by means of long hand lances equipped with nozzles producing a fine spray. The lances are moved about so as to reach all of the surface. If circumstances permit. the water may be applied by means of one or more manifolds carrying the spray nozzles. The flow of water is regulated so that the evaporative action of the hot surface together with the upward flow of gas and air prevent objectionable amounts of water from falling into the furnace.

The construction of some boilers is such that temporary metal or treated canvas troughs may be arranged to carry off the water, thus permitting the use of larger spray nozzles or more of them.

In some instances hot boiler feedwater is introduced through the conventional soot blower elements under a pressure of about 200 psig. Part of the water flashes to steam as it issues from the element nozzles. Advocates of this method report that it is effective in cleaning superheaters fouled with slag. The water must be conducted to each soot blower head by high pressure piping and reduced in pressure to 200 psig by

a reducing valve or an orifice. There must not be any valve downstream from the orifice. Telltale connections would be desirable to detect leakage of boiler feedwater into the soot-blower elements.

Permanent spray manifolds have been installed for routine washing of some economizers without the necessity of shutting down the unit. Experience has shown that maintenance of piping and valves is excessive and the practice is being abandoned. It is very apparent that if the water valves leak while the boiler is either in or out of service there is a real danger that severe corrosion will occur.

In order to counteract the acidity of the dirt-laden water, pretreatment of the wash water is sometimes undertaken to raise its pH to 10.0 or 11.0. As a further safeguard soda ash may be placed in localities where water might collect.

Hazards

Water washing by any method is accompanied by certain hazards. The greatest of these is undoubtedly non-uniformity in cleanliness at the conclusion of the cleaning operation. This matter is not of great significance as respects economizer surface but its importance respecting superheater surface cannot be overemphasized. If the cleaning is not uniform those areas which are the cleanest will be overworked for two reasons: (1) There is usually a greater mass flow of hot gas over the cleanest surface, and (2) Even assuming uniform mass flow, the insulating effect of residual fouling importantly contributes to unbalance of heat flow.

Whenever sulphur bearing slag and water combine, an acid solution is created. Experience with

external corrosion of economizers and air preheaters has shown how necessary it is to keep the flue gas temperature high enough so that the metal temperature will be well above the dew point of the flue gas. Similar reasoning applies in respect to water washing. It is desirable to use large quantities of water, when practical, for the purpose of diluting the acid. Immediately following water washing by any method, it is important to restore normal pressure and temperature so that residual moisture will be promptly evaporated.

It is well known that water striking hot brickwork will cause severe spalling. Even if the brickwork is cold it is very desirable to keep it dry because of the deteriorating action of steam formed in the refractory when the boiler goes back in service. Considerable effort should therefore be made to direct the wash water away from refractory parts of the setting. By the same token water should never be permitted to run down a water cooled wall of the bolted block-on-tube design because the water tends to dissolve the bonding cement between the blocks and tubes. If the brickwork does get wet it should be dried out thoroughly with a slow fire as would be the case with a new setting.

Prudence dictates that some caution be used in applying water to a superheater which is in operation and up to normal temperature. Water lances producing a 1/4" diameter stream of water under high pressure have been used for years without harm to the superheater tubes.

Slag Accumulation

Factors which have an important bearing on slag accumulations are listed below:

Design

- (1) Furnace volume
- (2) Disposition of heating surface
- (3) Arrangement of soot blowers
- (4) Combustion air system
- Fuel preparation and burning equipment.

Operation

- (1) Character of fuel
- (2) Heat liberation rate

(3) Operation and maintenance of fuel burning equipment.

The first two factors under Design are so fundamental they cannot be easily or quickly changed as respects existing units. However, when selecting new equipment it is well to look for ample furnace volume in relation to the maximum load to be carried.

The disposition of the heating surface in new equipment is likewise important. Wide lanes between vertical or nearly vertical tubes arranged in a rectangular (not staggered) pattern are easier to keep clean and are conducive to sustained low draft loss.

The soot blowing equipment in existing units may be subject to important improvements which might include modern mass action blowers, enlargement of the blowing arcs of certain elements and an increase in pressure of steam supply.

The combustion air system may contribute to slagging troubles when there exists a serious unbalance in air supply to several burners.

The fuel preparation and burning equipment cannot be ignored in a study of slagging problems. Coarse pulverization of coal and faulty mixing of fuel and air must be considered as contributory factors.

Of the operating factors, the character of fuel is probably the most important single factor in the slag problem. Unfortunately there is usually nothing that can be done about it short of a change to a better and ordinarily a more expensive fuel. Where fuel oil and natural gas are available some benefit seems to result from alternating these two fuels. The burning of gas seems to make the oil slag less tenacious and tends to burn it off the heating surfaces.

The heat liberation rate is considered to be of great importance in relation to slag formation. It is encouraging to note the tendency on the part of designers to be more conservative in this respect. In the latest boilers we find somewhat lower liberation rates than heretofore.

Slag will tend to build up at a rapid rate if the furnace exit gas velocity is high. Two courses of

remedial action are indicated. Firstly, every effort should be made to reduce the excess air to a minimum but deficiency of air must be carefully avoided. The reduction of excess air will tend to raise the furnace temperature which in turn will have the effect of reducing the life of furnace refractory and a compromise may become necessary. Secondly, it may be advisable to widen the gas lanes by removing or rearranging boiler and superheater tubes to accomplish a reduction in exit gas velocity. Alteration of the boiler baffling may prove to be beneficial. Installation of water cooled walls in place of refractory walls would definitely help.

Authorities on this subject recommend that the temperature of furnace exit gases be kept at least 100 F below the ash fusion temperature of the fuel. This again is directly related to heat liberation rate.

The fuel preparation and burning equipment sometimes presents an opportunity of reducing slagging troubles. Fuel oil should be heated to the proper temperature and supplied to the burners at the right pressure to obtain good atomization. The burners should be kept clean and worn tips should be promptly replaced. In some cases the distribution of air among burners is faulty. This suggests a study of air flow and correction by baffles, dampers, etc.

Other supplementary methods of cleaning than water washing have been tried with varying degrees of success. These included air lancing, steam lancing and blasting with sand or fly ash. In a few cases involving small units, air lancing has been found to be practical but water washing in some form is conceded to be the most effective means yet devised.

If it is certain at the outset that water washing will be necessary it is quite important to stipulate that new units be designed specifically for water washing. This will require that a sufficient number of lancing doors be provided at the proper locations and that drainage hoppers be arranged beneath the surface to be washed to carry off the wash water and prevent it from entering the furnace.



Maintenance of Cooling Towers



By HOWARD E. DEGLER

The Marley Company, Kansas City, Missouri

COOLING towers are frequently neglected because of their being located on the roof or several hundred feet away from the equipment served. The extremes of weather and unusual operating conditions encountered, make it important that a regular inspection schedule be set up; see accompanying table. In most cases a daily inspection schedule should be sufficient for continued efficient operation.

General Maintenance

Painting. All metal parts subject to possible corrosion should be cleaned and painted periodically. Redwood does not require protection from the weather; however, in some cases it may be desirable to paint redwood casings for appearance. Any high-grade outside house paint may be used. Water Treatment. There are three important water problems encountered in cooling tower operation and maintenance. They are (1) the proper amount of "blow down" to control the dissolved solids, and to minimize scale and corrosion; (2) the control of slime and algae; and (3) the protection of the wood. For best results, a competent water chemist should be consulted.

Delignification. Delignification is defined as the chemical deterioration of lumber caused by the removal of the lignin from the wood; it leaves the wood in long stringy fibers. It is generally caused by sodium carbonate in the water.

Delignification usually occurs in parts of the tower that are alternately wet and dry; here, evaporation greatly increases the concentration and the ill effects of the sodium carbonate. Sulphuric acid may be used to convert the carbonate to a sulphate. It is desirable to keep the pH value between 7 and 8. But the primary problem is the elimination of the chemicals producing delignification rather than the controlling of pH.

Tower Trouble Tips

- 1. Unusual noise or vibration may indicate:
 - Lack of lubrication, excessive wear, or corrosion in motor bearings.
 - b. Worn flexible couplings or universal joints.
 - Excessive misalignment between electric motor and gear reduction unit, if used.
 - d. Inadequate or unsuitable lubrication, faulty oil seals, excessive moisture (including rust and corrosion), or excessive wear (backlash and endplay) in gear reduction unit, if used.
- e. Non-uniform pitch of the fan blades.
- f. Loose fan-bulb cover, if used.
- g. Loose bolts in fan cylinder assembly.
- h. Loose connections in bolted joints of tower framing, particularly under electric motor and gear reduction unit.
- Scale or foreign substance in the water system indicates insufficient blow-down or inadequate water treatment.
- 3. V-belts and sheaves (if used) must be kept clean. If belts slip, clean and readjust belt tension. Do not use belt dressing.

| MAINTENANCE INSPECTION SCHEDULE General Recommendations (MORE FREQUENT INSPECTION MAY BE DESIRABLE) N-weekly; M-monthly; S-semi-yearly; Y-yearly; R-as required | Fan | Motor | Orles | Drive-Shaft | Geareducer | Dearing Housing | Elamanators | Filling | Cold Nater Basin | Distribution System | Float valve | Structural Members | Suction Screen | Steel Casing | 1 | 1 | |
|---|-----|-------|-------|-------------|------------|-----------------|-------------|---------|------------------|---------------------|-------------|--------------------|----------------|--------------|---|---|--|
| Check for unusual noise or vibration | × | 16 | 10 | 16 | n | W | | | | | | Y | | | | | |
| Inspect keys and keyway | | 5 | | 8 | 8 | | | | | | | | | | | | |
| Make certain vents are open | | | | | 56 | | | | | | | | | | | | |
| Check oil seals at Geareducer shafts | | | | | 5 | | | | | | | | | | | | |
| Check oil level, and oil for water & dirt | | | | | M | | | П | | | | | | | | | |
| Change oil for summer and winter | | | | | R | | | | | | | | | | | | |
| Lubricate | | S | | М | S | 5 | | | | | | | П | | | | |
| Inspect for clogging | | | | | | | | | 10 | w | | | 10 | | | | |
| Clean | | | | | | | R | R | R | W | | | 8 | | | | |
| Tighten losse bults | S | Y | | S | S | S | | | | | | Y | - | B | | | |
| Check for leakage | П | | | | M | | | | | | M | | | | | | |
| Inspect for general condition | | | М | 5 | | | Y | Y | | | Y | | | ¥ | | | |
| Test tension | | | M | | | | | | | | | | | | | | |
| Repaint. | R | R | | B | R | B | | | B | | | R | | R | | | |

How the maintenance man can reduce Corrosion Costs

By H. H. ANDERSON

Vice President and General Manager Shell Pipe Line Corporation, Houston, Texas

Corrosion can weaken structures and produce accidents; cause expensive products to leak and damage property; and can cut production. Here are tips on corrosion detection, prevention and remedy for the maintenance man.

WHY do manufacturing plants exist? They exist and operate, first, to provide goods or services which will maintain or increase the general standard of living; second, to make a fair profit for their owners; third, to provide a livelihood for their employees; and, fourth, to pay taxes, or so it seems. Plants can continue to perform these functions only if their equipment remains in good condition and will produce the goods and services cheaply.

Industrial equipment can fail or become non-competitive because of (1) mechanical break-down, (2) obsolescence, and (3) corrosion. Break-downs may occur due to abrasion, fatigue, or extraordinary strain. Equipment usually becomes obsolete when something else becomes available to perform the same function better or cheaper. Much metallic equipment is destroyed by corrosion due to chemical or electrochemical attack.

Often the men working in the

plant are not aware of the many other costs of corrosion besides the direct costs of the repair or replacement of equipment. Corrosion may weaken structures and cause accidents. It may cause expensive commodities to leak and to damage property or endanger persons. It may interrupt production or service, thereby reducing income and annoying customers. Such events usually bring public ill-will, customer ill-will, lawsuits, or other contingent losses.

This discussion indicates how the maintenance man can help to reduce this destruction of equipment and consequent losses from corrosion. Corrosion in most cases is caused by exposure of the equipment to harmful gases or liquids. Even the atmosphere contains harmful gases and vapors, and many extremely destructive gases and liquids are present in various plant processes. Underground corrosion is usually caused by a combination of gases and liquids in the soil.

The maintenance foreman is in much the position of a nurse attending a patient. The nurse must see that the prescribed treatment is carried out, observe its effect on the patient, and report her observations to the doctor. The doctor

Plant Maintenance Crew Furnishes Key Men in Reducing and Preventing Plant Corrosion

The maintenance man has the advantage of being on the firing line where corrosion is occurring. Having this advantage, he is in a position to observe where and—perhaps—why equipment corrodes. He can educate plant operators in avoiding practices or conditions which aggravate corrosion.

The maintenance man is often responsible, not only for supervising or directly performing all necessary repair and replacement work, but also for initiating it. Thus, his judgment may often avoid or cause break-downs or shut-downs that will stop production. Obviously, however, he must become corrosion conscious if his judgment is to be good in this respect.

The maintenance man need not become a qualified corrosion specialist. He can be very helpful if he will only learn, in a general way, the "how, why, when, etc." of corrosion detection, prevention and remedy.



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will study these observations, check the diagnosis, and perhaps change the prescription, if necessary, to hasten the cure. The nurse can do her job more effectively as she picks up more medical knowledge. Likewise, the foreman should see that equipment installation plans are followed; and he should watch the equipment during operation and report unsatisfactory conditions through the proper channels. He can perform these duties better as he learns more about corrosion prevention and control.

The steps in any program aimed to combat corrosion are: (1) prevention, (2) detection, and (3) mitigation.

Corrosion Sources

The best time to prevent corrosion is during the original design and installation of the equipment. Proper selection and placement of materials will go far to prevent their future damage by corrosive gases or liquids. Thus designers and installers should, as far as practicable, avoid the creation of sources of corrosion. Specifically, they should avoid the creation of electrochemical, thermocouple and stress electrical "cells" that are the basic causes of all corrosion.

The simplest way to grasp the whole idea of electrochemical corrosion is to consider the common "dry cell" or dry battery. In the battery, corrosion is put to beneficial use, but the battery serves to show how corrosion occurs. The battery is made of a carbon rod surrounded by a mild acid-soaked pulp in a zinc can. Terminals are attached to the carbon and the zinc.

When the battery terminals are not connected, very little happens within the zinc can. When they are connected to form a closed circuit, the acid in the pulp starts to corrode the zinc (or "anode") and generates an electric current which flows through the wire. This action will continue as long as the circuit is closed, or until the acid is expended or the zinc is destroyed. In this corrosion process, a portion of the acid joins the zinc to form inert zinc sulphate, and the rest of the acid is liberated as hydrogen gas which travels through the pulp to the carbon rod (or "cathode"). The

carbon rod suffers no change.

Thus in this simple battery we can visualize the whole process of electrochemical corrosion and its prevention. The corrosion does not occur until a closed circuit is provided. The corrosion itself is the destruction of the zinc. "Cathodic protection" is provided by the action of the hydrogen film to envelope the carbon rod and prevent it from being harmed by the acid. And an example of the other customary way of stopping corrosion would be to insulate the inside of the zinc can from the acid by coating it with an electrically impervious material.

In the battery, the chemical attack initiated the flow of electric current. Conversely a flow of impressed current from an external source (as different from the selfgenerated current in the battery) from a metal into a surrounding gas, liquid or soil will cause another type of corrosion called "electrolysis." Regardless of whether (as in true corrosion) the chemical attack initiates the current flow or (as in electrolysis) the current flow initiates the chemical action, the corrosion damage is physically similar. Also, in either case a current out-flow of one ampere in one year will destroy as much as 20 lb of iron or steel, or 70 lb of lead.

In a plant there are many situations which can create electrochemical corrosion cells.

a. Good electrical contact be-

tween two or more unlike metals exposed to corrosive gases or liquids. Here the baser metal (the most susceptible to corrosion) corrodes as does the zinc in the battery.

b. Inclusions of foreign material or non-uniformity in the same metal. Examples are the dissolving of zinc out of brass (leaving the copper), called "dezincification," and the dissolving of pure iron out of cast iron (leaving the carbon), called "graphitization."

c. Imperfections on the same metal. An example is failure to remove mill scale from a metal surface. The scale acts as a second metal to set up a local battery action.

d. Different concentrations of the same chemical in adjoining parts. In a steel water tank, for example, the metal rusts near the surface of water and remains bright near the bottom. This is because there is more dissolved oxygen near the surface to combine with the metal to form rust.

e. Combination of two non-corrosive chemicals to form a corrosive mixture. An example is the rusting of iron by salt water. Neither dry salt nor pure water will cause much rust separately, but salt-laden vapor is very destructive.

Most plant men are familiar with

Corrosion Sources and Prevention in Brief

Keep These Corrosion Sources in Mind

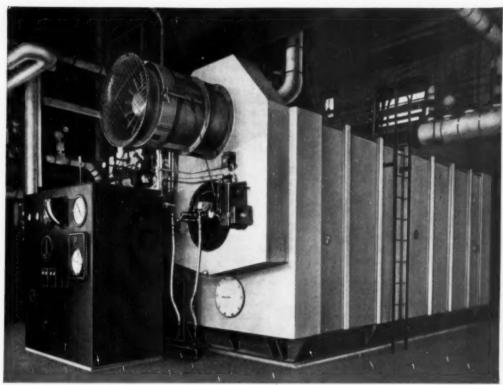
Good electrical contact between two or more unlike metals exposed to corrosive gases or liquids . . . inclusions of foreign material, non-uniformity or imperfections . . . different concentrations of the same chemical in adjoining parts . . . combination of two non-corrosive chemicals to form a corrosive mixture . . . current that is generated between stressed and less-stressed parts of metal equipment.

Prevention or Reduction Methods

Change condition of metallic surfaces—install electrical bonds between dissimilar parts of equipment . . . make machine part from baser metal . . . make machine part from a nobler metal . . . install cathode protection . . . stress relieve.

Change condition of gas or liquid, or flow—chemical "neutralization" of gas or liquid . . . metal surface pacification . . . increasing rate of stream flow . . . eliminating crevices in construction.

Isolate metal with inert coatings—a good inert paint coating will isolate the underlying metal electrically as well as chemically. Coatings, especially paints, are probably more universally used than any other type of corrosion protection.





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G-560

thermocouples used to measure temperatures in equipment or processes. Possibly the manner in which they operate is not so well known. If two metals are joined and heated at the junction, a flow of electric current is generated. The voltage of this current will become greater as the temperature at the junction becomes higher. Thus measurement of the voltage will give an index of the temperature at the junction. Although less commonly known, an electric current also can be generated in a single piece of metal if one end is hot and the other is cold.

Such currents can cause corrosion if closed metallic circuits are not provided for their flow. Both kinds of thermocouples are created in heat exchangers, and they often cause the type of corrosion known as electrolysis where the currents leave the metal to enter other parts of the circuit.

Another source of corrosion is the electric current that is generated between stressed and less-stressed parts of metal equipment. The pitting of piston rods is a typical result of unequal mechanical stresses created during operation. Stress corrosion also occurs in non-moving parts which have been internally stressed by cold or hot working. Rivet corrosion is an example of this type.

Many of the above corrosion sources are unavoidable in practical design because of other necessary considerations. Often the selection of a design allowing some corrosion may be the lesser of two evils. But these possible corrosive points should be known to the maintenance foreman as well as the designer, and preventive methods should be provided to minimize their harmful effect.

Corrosion Prevention

Among the effective preventive methods that may be applied, depending upon the conditions encountered, are the following:

1. Installing electrical bonds between dissimilar parts of equipment. Provision of an electrical path of proper low resistance between hot and cold points of a system is an example of bonding. Bonds of improper design, however, can aggravate instead of retard corrosion. Thus, bonds should be used only when they can be properly engineered and installed by experienced personnel.

2. Making the machine part from a baser metal (one more susceptible to corrosion), thus distributing the same total corrosive action over a larger area and thereby increasing the service life of the part. This often can be accomplished by covering steel or iron parts with coatings of zinc, chromium, aluminum, or other non-ferrous metals. These coatings give corrosion protection while retaining the mechanical strength of the steel or iron. The occurrence of breaks in such metallic coatings will not cause local pitting because the remaining coating "cathodically" protects the exposed spots.

3. Making the machine part from a nobler metal (one less susceptible to corrosion), thus reducing the extent of the total corrosion. Here, too, a base metal such as iron can be coated with a nobler metal such as lead, nickel, tin or copper to accomplish the same purpose. However, this method is often unreliable because in case of coating breaks the entire corrosive action is concentrated in that small area.

4. Installing Cathodic Protection. Reference was made above to the coating of hydrogen gas formed on the carbon in the dry battery. About 120 years ago, Sir Humphrey Davie, discovered this effect and found that it could be applied beneficially on purpose. He soldered a small piece of zinc on the copper sheathing of a ship's hull. The salt water then formed a battery with the zinc and the copper, and attacked the zinc instead of the copper. The zinc was consumed, and the copper was protected from corrosion by the hydrogen film which was formed on it. As above indicated, this form of corrosion prevention was given the name of "Cathodic Protection."

More recently, aluminum and magnesium as well as zinc have been used as the consumable metal in cathodic protection. Cathodic protection is also accomplished by suspending carbon rods or pieces of scrap iron in the corrosive liquid (or burying them in corrosive soil)

and forcing a direct electrical current into them from a rectifier or motor-generator. Cathodic protection is applicable in protecting condensers, the interior of water tanks, and the exterior of underground piping.

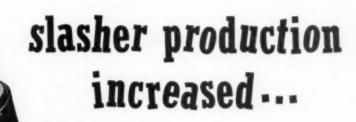
5. Stress relieving. Quite often corrosion due to internal stress differences can be prevented by relieving the stress with a low temperature treatment such as annealing. This method should be applied only with caution because such annealing will reduce the structural strength of the metal.

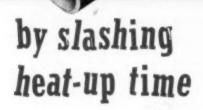
In the examples just given, the corrosion is prevented or reduced by changing the condition of the metallic surfaces. Other methods involve changing the condition of the gas or liquid, or the conditions of its flow, as follows:

1. Chemical "neutralization" of the gas or liquid. An example of such neutralization in the handling of sulphur-bearing crude oil is the formation of less-corrosive sodium sulfide and water by the addition of caustic soda (sodium hydroxide) to neutralize the corrosive hydrogen sulfide. Neutralization usually is an expensive method of getting results, although sometimes it is the only one that is practically effective.

2. Metal surface pacification.
This is accomplished by forming a protective chemical film on the metal surface by addition of another chemical to the gas or liquid. However, with certain types of films, pitting may be increased if the film is not maintained by continued chemical injection. Surface pacification is usually less costly than neutralization. It is important that the allowable contamination of the process product be considered when applying any chemical treatment.

3. Increasing the rate of stream flow. Liquids flowing at rates causing "turbulence" will often mix the corrosive and non-corrosive constituents so that the resultant corrosion is reduced to an extent that can be tolerated. However, when this flow is decreased below the "critical" velocity, the corrosive constituents may separate and cause localized corrosion which will reduce equipment service life. Corrosive salt water in crude oil may





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be relatively harmless until it is permitted to settle out.

4. Eliminating crevices in construction. The eddies in liquid flow that develop at crevices will allow sediment to collect. The local chemical concentration may thus start corrosion. The space between pipe ends in a threaded coupling, and icicles in pipe at sloppily welded joints, are sources of such trouble.

Protective Coatings

The third method of corrosion prevention or control is to isolate the metal by inert coatings. A good inert paint coating will isolate the underlying metal electrically as well as chemically. Some surface coatings are used to improve appearance as well as to prevent corrosion.

Coatings, especially paints, are probably more universally used than any other type of corrosion protection. Because of this widespread use, it is well for the foreman to know why paints fail in service. Paints fail from several causes among which are the following:

- Application on improperly cleaned surfaces.
- 2. Excessive heat in service.
- Chemical combination with environment gases or liquids.
- Softening or dissolving in the surrounding liquid.
- Unequal heat expansion of paint and underlying metal.
- 6. Moisture penetration.
- Mechanical shock and abrasion.

These causes for failure should be considered in the selection of a paint for any particular condition.

Qualified maintenance supervisors, if given the opportunity, can very definitely assist in the original design and installation for corrosion prevention. They can profitably review proposed plans to point out danger points that may often be overlooked by designers who are less familiar with day-to-day operating problems and past equipment failures. If they are to supervise construction or installation, they should see that the work is done in conformance with the plans.

Corrosion Detection

If design and installation of equipment has been made with corrosion prevention in mind, the detection of corrosion is simple. The foreman needs simply to be always on guard, and watch particularly the potentially weak points in the equipment. Unfortunately, many plants have not been so designed or installed, and here detection is even more difficult if no corrosion study has been made to determine or predict locations affected. The maintenance supervisor or competent designated personnel should definitely make such a study.

As a guide in making such a survey, the following suggestions are offered:

- Study all existing service and maintenance records. If not already compiled, failure and replacement records should be compiled and studied.
- Inspect all equipment shutdowns for possible corrosion sources.
- 3. Examine products for contamination by corrosion.

- Determine reasons for spillage and leaks.
- 5. Inspect paint failures for their causes.
- Study changes in operating practices for their corrosion effects.
- Where corrosion attack is suspected on the inside of vessels or pipe, make use of available instruments which can measure metal thickness from the outside.
- Measure electrical voltages between suspected corrosive and noncorrosive points.
- Last, but not least, train maintenance subordinates and operators to watch for possible corrosion, stressing that an ounce of prevention saves tons of emergency repairs.

The maintenance foreman may not be in a position to make some of these investigations, but he can report to his supervisors that he thinks they are necessary.

Benefit From the Experience of Others

Corrosion prevention and control are usually simple in principle, but often difficult and costly in practice. As the farmer said, "They may involve not only the cost of a lock for the barn door after the horse has been stolen, but also the cost of replacing the horse."

Corrective measures after a corrosion failure requires much more effort than would have been required in the first place to prevent the failure. The maintenance man who can benefit from the experience of others will initiate measures to prevent failures before they occur. The one who benefits only from his own experience should at least have corrosion preventive measures installed after he finds out the hard way that they are necessary.

Remembering that a lazy man often does a job the easiest way, we may conclude that a maintenance supervisor should be lazy—lazy to the extent of avoiding work by intelligently preventing its need. He can become a member of technical associations, such as the National Association of Corrosion Engineers, and attend meetings. He will meet many men having practical problems similar to his. He can benefit from their experience by discussing his and their problems. He should contribute his own experience as the best way to share the experience of others.

The maintenance man should study problems and their solutions in unrelated industries, such as reported in the industrial press. He will often find solutions of problems in other industries which, with little change, can be adapted to his own problems. He should also train his maintenance helpers and the plant operators to assist in detecting corrosion before it does serious damage. He has only two eyes and usually only eight hours a day to use them in the plant. These can be multiplied by the eyes and days of as many men as are in the plant crew.

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Horsepower per Ton of Refrigeration

WE hope that it is as low as possible because horsepower per ton is in a sense a measure of efficiency. If you are an average plant operator, you may not know what your hp per ton is; nor have you worried very much about it.

It is horsepower, or actually kilowatt-hours, that you are buying to produce tons, so obviously it is to your advantage to keep the horsepower as low as possible for a given capacity and condition.

Horsepower per ton will, of course, vary with condenser pressure and suction pressure. The accompanying table gives the indicated horsepower required to produce one ton of refrigeration with an ammonia reciprocating plant.

How To Determine Tonnage

Here is a practical means of determining the tons of refrigeration any plant is producing.

If water is being cooled, first determine the quantity of water in gallons per minute. This can be done with a flow meter or if this is not available then a calibrated container and stop watch will suffice. Then determine the temperature range in degrees Fahrenheit through which the water is being cooled. Then use this formula:

 $\begin{array}{c} {\rm Tons} = ({\rm GPM} \times {\rm temperature} \\ {\rm range}) \div 24 \end{array}$

If brine is being cooled, again determine the quantity in gallons per minute and the temperature range in degrees Fahrenheit, and use this formula:

Tons = (GPM \times Temp. range \times sp. gravity of brine \times sp. heat of brine) \div 24

If there is no brine or water being circulated such as is the case when direct expansion cool-

By R. S. SANDIFER

Sales Engineer, York Corporation Houston, Texas

ing coils are used to cool air, then the plant tonnage can be determined from the condenser tonnage. Meter the water flowing through the condenser and find temperature range of the water, and use the following formula:

 $\begin{array}{c} \text{Tons} = (\text{GPM} \times \text{Temp.} \\ \text{range}) \, \div 28 \end{array}$

When making the capacity test it is desirable to maintain a steady load. Accurate thermometers calibrated to at least 1/5 degree F should be used. It is a good idea to interchange the inlet and outlet thermometers so that any error in range can be corrected. Thermometer wells should be provided in water and/or brine lines to and from chillers and also in condenser water lines. Where thermometer wells have not been provided, the well shown in the sketch is a fair substitute when liquid filled and properly insulated

Thermometer wells should always be installed to provide for liquid filling. Use oil for temperatures of 32 F and above. Use mercury or brine for temperatures below 32 F. Do not use mercury in a brass or copper well.

How To Determine Horsepower

Assuming that the refrigerating machines are electric motor driven, it is a simple matter to determine the motor load by means of a wattmeter. If a wattmeter is not available then the local power company will normally perform this service for you. It is essential that the motor load be recorded simultaneously with the capacity test.

What The Findings Mean

If the test reveals a low or nominal horsepower per ton for the conditions as shown in the table, then the plant is in an efficient condition. It is likely however that the test will reveal a higher than normal horsepower per ton. This could be caused by two major factors; improper design and inadequate maintenance. Improper design, although entirely too frequent, will not be discussed here. We will rather assume the plant to be properly designed and consider the problems of maintenance.

Causes of High Horsepower

As may be observed from the table, high horsepower per ton is a function of suction pressure and condensing temperature. The lower the suction pressure and the higher the condensing tempperature the higher the hp per ton. Since we are seeking the lowest possible hp per ton it follows that low condensing pressure, and suction pressure as high as allowed by the temperature of the product being cooled are desired. Let's treat each of these two fundamentals separately considering causes and remedies.

Condensing Pressure

Since more plants operate inefficiently as a result of excessive condensing pressure than for any other reason, let's see what causes high pressure.

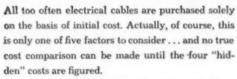
- (1) Dirty or scaled condenser tubes. This condition can be detected by a smaller than normal temperature rise in the condenser water. This condition can be corrected by removing the condenser heads and scraping the condenser tubes.
 - (2) Air in condenser. Since air

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DO YOU FIGURE



ALL FIVE?



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- installation costs
- maintenance costs
- costs of power shutdowns when a cable fails
- costs of replacing a cable which has failed prematurely.

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is non-condensible at working temperatures, it stays in the condenser and following Dalton's law of partial pressures, combines with the pressure of the ammonia to give a resultant higher pressure against which the compressor must operate. This trouble can best be detected by checking the liquid temperature against the temperature corresponding to the condensing pressure. The pressure gauge has a corresponding temperature scale. If the temperature shown on the pressure gauge is higher than the temperature on the liquid line thermometer, then the condenser has air in it. Most condensers have purge valves to which a rubber hose can be connected. Place the other end of the rubber hose in a jar of water and slowly crack the purge valve. As long as bubbles are evident in the water, air is being purged. When the bubbles disappear then only ammonia is escaping and the system is free of air. Another check of temperatures should then be made.

(3) Insufficient water. This trouble can normally be detected

Improvised thermometer well

GASKET

WALL

STEEL CONDUIT, SAWED TO FIT

Indicated Horsepower per Ton of Refrigeration

| Suction | | Condenser Pressure and Temperature | | | |
|-------------------------|-----------------------------------|------------------------------------|------------------------------|---------------------------------------|---------------------------------------|
| psig | °F | 105 psig 65.9 °F | 145 82.5 | 185 96.3 | 225 108 |
| 15.67 25 35 45 | -17.2 0 11.3 21.4 30. | 1.3 191 1695 .515 .414 | 1.65 1.195 .943 .75 | 2.01 1.487 1.197 .98 .822 | 2.35 1.785 1.47 1.21 1.02 |

by an excessive rise in temperature of water through the condenser. The cause might be a malfunctioning pump or a restriction somewhere in the water circuit. The range of condenser water temperature should be between 6 F and 8 F. And if a greater range is encountered then a shortage of water is evident.

(4) Water too warm. This can be observed on the thermometer on the water inlet to the condenser. Normally with cooling tower installations, the cold water temperature should not be more than approximately 8 F above the air wet bulb temperature.

Suction Pressure

The second most common cause of inefficient operation is suction pressure being too low. Let's see what causes low suction pressure:

(1) Low refrigerant charge. This should hardly warrant mention, but it is still very common. This can normally be detected at the liquid level indicator on the receiver. It is corrected by adding refrigerant.

(2) Insufficient evaporator. Again we are excluding design so assuming a properly sized evaporator, what causes insufficient evaporation?

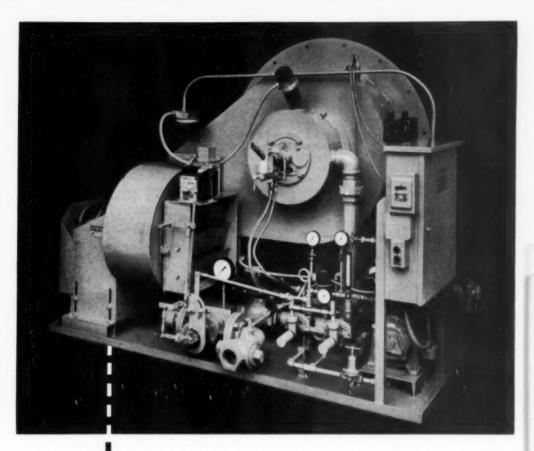
- (a) Excessive frost. Frost acting as an insulator thus demands a lower refrigerant temperature for the design transfer of heat. This is corrected by defrosting.
- (b) Oil logged. Oil too is an insulator and has the same effects as frost. This condition is corrected by drawing or blowing oil from the system. It is better to keep oil out of the evaporator in the first place, but no operation is perfect.
- (c) Dirty suction line strainer. This is hard to detect since it is not apparent on the suction pressure gage. It is best to check this strainer periodically every six months.
- (3) Faulty liquid feed control. This condition could exist with hand expansion valves, float valves, or thermostatic expansion valves. Regardless of the type of control it should be adjusted for the proper feed. Too much feed

Editor's Note

Mr. Sandifer has provided an excellent discussion of the fundamentals involved in checking performance of refrigerating equipment. He has perhaps over-simplified his explanation by assuming that the reader understands how to interpret Indicated Horsepower correctly. Actually, indicated horsepower cannot readily be compared with the electric meter reading, because there are several conversion steps between the two factors. The meter reads kilowatts instead of horsepower; and also, both compressor efficiency and motor efficiency enter into the calculation.

The operator can, however, by discussing his particular plant with an experienced refrigeration engineer, write down the necessary index figures that will make all future checks very easy indeed.

The editors recommend that those plant men who plan to make Mr. Sandifer's article a part of their working knowledge, study it carefully, and have the above mentioned factors carefully explained to them. Public utilities will usually have one of their engineers make such explanations without charge.



COEN PACOMATIC OIL & GAS BURNERS

Coen Burners are fully automatic and are made for gas, oil or combination fuels. They may be installed on new or existing boilers from 50 to 800 horsepower . . . a Coen Pacomatic Burner, complete and factory assembled, is the answer to your boiler efficiency problem. Write for information today!



COMBUSTION ENGINEERS and MANUFACTURERS



· DIL AND GAS BURNER EQUIPMENT FOR INDUSTRY

Atlanta, Georgia

Stephen C. May 585 Sherwood Rd., N.E. General Eastern Office

P.O. Box 7 Union City, N. J. Charlotte, N. C.

Robt. S. Hudgins, Jr. P.O. Box 6071 is as bad or worse than too little but that will be discussed later.

Liquid Slopover

The major consequence of liquid slopover is excessive wear and tear on the compressor. This can also effect the horsepower per ton of the refrigerating plant since more power is required to pump liquid than to compress gas. The most common cause of liquid slopover from recent observations has been the improper setting of thermostatic expansion valves. For the benefit of the many owners and operators that are not familiar with the procedure of checking superheat from the evaporator let us mention it briefly:

- (a) Connect a pressure gage to the suction line as close to the evaporator as possible.
- (b) Place a thermometer in the thermometer well on the suction outlet from the evaporator. If a

thermometer well is not provided, then use the type shown in the sketch.

- (c) Read the suction temperature which corresponds to the suction pressure. This is the temperature of the liquid in the evaporator.
- (d) Read the actual temperature of the suction gas leaving the evaporator.
- (e) Subtract (c) from (d). This difference is the suction gas superheat, and for most applications should be 5 F to 10 F. If the superheat is insufficient, then the valve is feeding too much liquid and should be adjusted accordingly. If the superheat is excessive, then adjustment should be made to open the valve wider.

Excessive Superheat

This is just the opposite of liquid slopover and is equally disastrous not only from the stand-

point of excessive wear, but this also increases the horsepower per ton. If this condition cannot be corrected at the liquid control valve such as in the case of excessively long suction lines, then a suction gas desuperheater should be installed. A less expensive manner of desuperheating suction gas is to expand a small amount of liquid into the suction manifold. When this is done on compressors with automatic operation, a solenoid valve must be installed in the liquid line to prevent feeding liquid into the compressor during shutdown.

Conclusion

To improve the horsepower per ton of any refrigerating plant, it is necessary to: (a) lower condensing pressure, (b) raise suction pressure, (c) eliminate liquid slopover and (d) eliminate excessive suction superheat.

Avoid Those Inefficient Re-Drives

Usually any ordinary belt drive shows a slip (in the form of creep) of 2 per cent when pulling full load, due to the stretch of the belt. This is unavoidable. All belts stretch and therefore creepeven the best of them. But when the slip exceeds 2 per cent, the power loss becomes a serious factor.

If we have a motor (lower left hand corner) delivering power to a line shaft, and if the slip of that drive is 4 per cent, we cannot possibly have a higher transmission efficiency than (100-4) 96 per cent. We are neglecting bearing friction losses, belt hardness and inflexibility, and windage in this discussion.

From this line shaft, we will drive line shaft number 2, where we again have a slip of 4 per cent and a unit efficiency of 96 per cent. The over all transmission efficiency, therefore, is (0.96×0.96) 92 per cent between the motor and second line shaft.

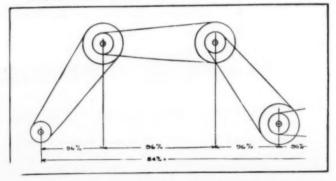
It is not uncommon to continue

the extension of drives in this manner four, five, six, and even more times. We do not realize how inefficient this process is until we analyze it carefully. Thus, by extending another unit the over all transmission efficiency to the third shaft falls to (0.96 x 0.96 x 0.96) 88½ per cent, and if we extend still an-

other unit, and if the final driven machine is on the fourth shaft, the over all transmission efficiency is only (0.96 x 0.96 x 0.96 x 0.96) 85 per cent.

Over 15 per cent of the fuel, therefore, is lost in belt slip alone. The seriousness of this matter becomes the more apparent when we consider that we are completely ignoring bearing friction and other frictions.—S. F. Worthington, Arangee

Power loss becomes a serious factor when slip exceeds 2 per cent — especially if the drive is arranged like this. The loss multiplies itself as many times as there are unit drives.





In January, 1940, Southland Paper Mills, Inc.,

Lufkin, Texas, began the first commercial production of newsprint from Southern yellow pine. That year Southland produced 32,000 tons of newsprint. Today, Southland is producing 160,000 tons of paper and paper products a year.

For the safe lubrication of all its interior and outdoor machinery, Southland relies on Sinclair LITHOLINE® Multi-Purpose Grease. In addition to the big paper machines inside the plant, LITHOLINE is used to lubricate all conveyors, debarking machines and unloading units in the yards.

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SINCLAIR LITHOLINE



... for every grease lubrication job **UTAH** Goes to

UTAH POWER & LIGHT CO., SALT LAKE CITY, UTAH 575,000 lbs./hr. - 1700 psig, 1000°F. - 525,000 lbs./hr. reheat - 396 psig, 1000°F. Bechtel Corp., Engineers.

Utah Power and Light Company is installing a 575,000 lbs. per hour 1700 psig 1000°F. Riley unit with 525,000 lbs. per hour reheat at 396 psig and 1000°F. at its Gadsby station at Salt Lake City as unit No. 2. Some of the outstanding features of this unit are mentioned on the following page. Unit No. 1 now in operation is a 620,000 lbs. per hour 1500 paig. 955°F. Riley unit. Unit No. 2 is to be fired with Riley "50" Pulverizers. Unit No. 1 is fired with petroleum pitch but designed for future pulverized coal firing.

At its Hale Station, Utah Power has installed a 450,000 lbs. per hour Riley pulverized coal fired unit and another Riley unit is installed at its subsidiary Western Colorado Power Co., Jim Bullock Plant at Montrose, Colorado.

Engineering Data

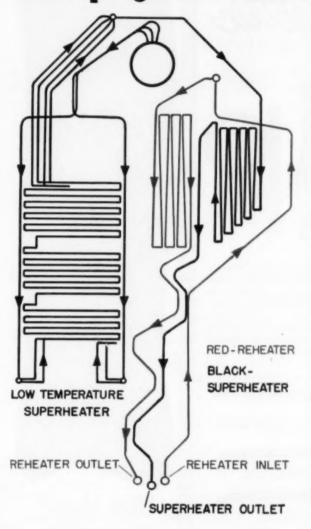
Capacity, 575,000 lbs./hr. Design Pressure, 1,700 psig. Steam Temperature, 1,000°F. Reheat Temperature, 1,000°F. Furnace Volume, 53,000 cu. ft. Temp. Furnace Exit Gas, 1,900°F. Furnace Width, 29'3" Furnace Depth, 23'107" Efficiency, 87.8% Fired by 4 Riley "50" Pulverizers and 12 Riley Flare Type Burners





BOILERS . PULVERIZERS . BURNERS . STOKERS . SUPERHEATERS . FLUE GAS

1700 psig 1000° F and 1000° F Reheat



Reheater Partially Radiant

Due to the large amounts of heat required to give 1000°F. steam temperatures for both superheater and reheater, design features must be incorporated which will give the desired steam temperatures and at the same time permit operation at sufficiently low furnace temperatures to prevent objectionable slagging of furnace and screen tubes.

Riley accomplishes this by making the first section of the reheater of radiant surface as illustrated in the accompanying diagram. With the relatively low reheater inlet temperature and high positive flow velocities the use of radiant surface is definitely warranted. By this design the desired steam temperatures are obtained with entering gas temperatures well below the danger point.

Uniform superheat temperatures over a wide load range are obtained by means of by-pass dampers beyond the economizer. A spray type temperature control is provided for the reheater. The use of four rows of burners also aids in controlling steam temperatures.

All tubes entering the upper and lower drums are welded to stub ends, shop welded into the drum shells. All superheater and economizer tubes are likewise welded to stubs ends welded to the headers. Such construction assures permanent tight connections.

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

... it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

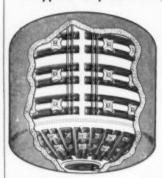
ECONOMIZERS . WATER-COOLED FURNACES . STEEL-CLAD INSULATED SETTINGS . AIR HEATERS

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Easy to Install CHROMALOX Electric Strip Heaters give clean, dependable and accurately controlled heat where and when heat is needed. They produce uniform and accurate temperatures by automatic or manual controls. Low initial costs, low installation costs and low operating costs are among the many advantages of using CHROMALOX Strip Heaters for heating liquids, gases, viscous fluids, tanks, platens, molds, moving parts, etc. Get the full details now.

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Segment Heaters fill the gaps

<u>CHROMALOX</u> Electric Heat for Modern Industry

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Want Ideas?

on how to use Chromalox Electric Heaters in your plant



Write for the data-packed Catalog 50 which describes many types of Chromatos Electric Heaters and how to apply them. It's yours without obligation.

Servicing and Maintaining **Inverted Bucket Steam Traps**

EVERY steam trap which has been in service for a long period will foul up with dirt and internal parts will wear. These traps can be put back into first class shape usually in a small amount of time and at much less expense than a new trap. There are only two ways in which a trap will fail to operate: (1) It will not open or (2) It will not close

The following "on-the-job" maintenance data, shows what to look for and how to correct it. Save the chart and refer to it the next time you have trap servicing that must be done. It may save you considerable time in locating the difficulty and correcting it.

If Trap Fails to Open What to Look For Remedy

- 1. Dirt-either the bucket from working or some dirt has accumulated on the mechanism causing it to stick.
- 2. Vent hole in top of bucket plugged.
- 3. Mechanism worn or out of alignment.
- 4. Initial pressure too high.
- 5. High back pres-

- 1. Clean thoroughly use body is filled with coal oil or solvent if necesdirt preventing the sary. Inspect parts for wear and replace any worn parts. Inspect orifice opening to make sure it is not plugged.
 - 2. Clean use care not to enlarge this hole.
 - 3. Replace with new parts.
 - 4. Replace valve and seat with one for higher pressure.
 - 5. If operating under relatively low pressure, back pressure may build up in return line and trap will not discharge. To overcome this situation increase the initial pressure or reduce back pressure. The trap itself cannot remedy this condition. To determine if this condition exists, install a pressure gauge at trap on the inlet side and also one on the outlet side to find out what the differential pressure is.

If Trap Fails to Close What to Look For

- 1. Clean thoroughly. 1. Dirt under the valve will keep it open.
- , 2. Loss of seal.
- 2. Inverted bucket traps must be primed so that the bucket will float when steam enters. If the prime is lost pour water in the trap or close valve either ahead or behind trap permitting condensate to accumulate and the trap can form its own seal.
- 3. Worn valve and seat.
- 3. Replace with new parts
- 4. Trap is too small.
- 4. Check capacity and replace with larger trap of correct size.
- 5. Do not mistake flash steam for live
- 5. Temperature of the condensate being discharged is the same as the steam in the trap and when the condensate reaches atmosphere the temperature drops rapidly and flashes into steam. If this situation is extremely bad possibly a flash tank is needed.

Data courtesy, The V. D. Anderson Co.

Severe V-Belt Service AN old headache in almost any

stock dyed cotton extractors. Each of our mills has three of these extractors in their Dve Houses. The

V-belt drive for each unit consists of three No. C-120 belts running

between a 7.75 in. pitch diameter motor pulley and a 15.375 in. pitch diameter machine pulley. This

drive is powered by a 71/2 hp motor.

The load consists of a 48 in. diam-

eter rotating basket containing

about 1000 lb of saturated dved or bleached cotton. From 3 to 5

minutes are required to bring the basket up to speed. This is a tre-

mendous load for only three belts

with such small pulley diameters.

In addition, only 11% in. adjust-

ment is provided for changing and

off the pulleys during the first start-

ing cycle after being installed.

These belts are no longer usable as

there is insufficient adjustment to

keep them tight. The average life

of ordinary belts varies from one

week to one month. Perfectly good

belts have to be removed due to our

inability to adjust them tightly.

Some new belts stretch and jump

tightening the belts.

cotton mill is the poor life of V-belts driving centrifugal raw

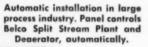
BELCO combines the best in design with automatic

control



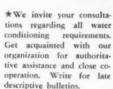
BELCO CAMOMATIC VALVE

required for nortion. When instruraw water has been used the softening cycle is set in operation, automatically. The Camomatic valve is easily adapted to pressure filtration and other process control These valves are being used in some of the country's finest plants



Belco has built the largest automatic silica removal demineralizer plant in the world. Your needs will be met with unmatched engineering knowledge and with equipment designed to do your job.







BELCO HIGH PRESSURE STEAM DEAFRATOR



Belco Industrial Equipment Division, Inc. PATERSON 3, NEW JERSEY



The Belco Camomatic Valve re-places the seven individual valves mal softener operaments indicate, or when a predeter-mined amount of

Matched Set

The solution to this problem has been a set of three belts having matched lengths and also as short a length as can be obtained for C-120 belt stacks. In addition, a minimum of initial stretch can be allowed. After trying several makes including some with steel wire cores, we have found that the Dayton Rubber Company Cogg Belts give the best service. These belts will run for many months if properly selected and installed. We have found that by advising the manufacturer of the exact requirements of the drive, he can supply a matched set of belts that will give excellent service. These belts save our mills considerable money through their longer life and through the reduction of machine down time for changing belts .-Robert J. Tucker, Plant Engineer, Roanoke Mills Company, Roanoke Rapids, N. C.

PROCESSES FOR

RELCO

ATOMIZING

REMOVAL OF WATER IMPURITIES

MODERNIZED BOILERS

DETROIT SINCE 1898 STOKERS

STOKERS PAY BIG DIVIDENDS







DETROIT STOKER COMPANY

General Motors Building . District Offices in Principal Cities . Works at Monroe, Mich.

Detroit 2, Michigan

Modifications minimize excessive wear on

Traveling Screen Operation

at Plant Atkinson, Georgia Power Company

By R. S. CAUSEY, Superintendent, Plant Atkinson

FAR several years we at Plant Atkinson have felt that wear has been excessive on the traveling screens protecting the condenser cooling water inlet.

As time passed it became more and more apparent that our wear was coming from two sources—the excessive amount of sand and silt carried in suspension by the Chattahoochee River; and the lack of knowing how much, or how little, tension we were putting on the chains, when periodic take-ups were made with the screens in operation.

Obviously, there is little or nothing we could do to eliminate the first source of trouble. However in an attempt to alleviate the wear caused by improper tension, we have made the changes shown on the accompanying drawings.

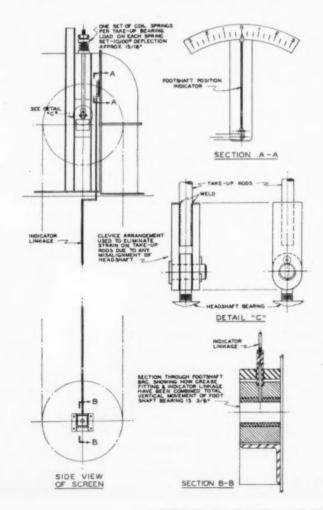
Essentially all that we have done is to hang all of the moving parts of the screen from two sets of coil springs. The manner in which this was done is shown in the side elevation of the screen.

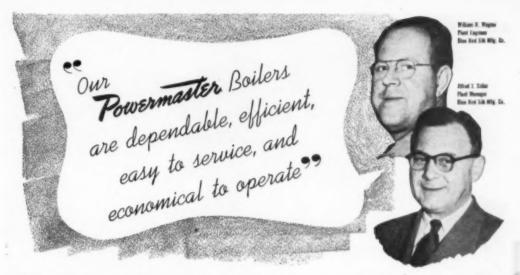
As a result of this, the only tension we have on the chain is that caused by the weight of the chain and baskets, plus the additional we ight of the footshaft and sprockets.

The footshaft bearings have been re-arranged so that they are now of a full floating type, being restrained in the horizontal direction by the bearing support plate and collars on the shaft. Vertically the bearing is allowed % in. of movement. It is felt that this amount of movement is great enough to allow the footshaft to float, but not so great as to allow any large pieces of trash to slip

under the baskets. The details of these bearings are shown in Section "B-B". Before water is admitted to the screen, the footshaft is adjusted by means of the upper take-up bearings until the bearings are midway between the stops. With the footshaft in this position the needle on the indicator is adjusted to read zero, as shown in Section "A-A".

After the initial adjustment, and the screens are put back in service they are readjusted to bring the indicator back to zero. This is to counteract any upward forces due to buoyancy or lift caused by the drive that was not





20% Saving in Steam Cost at York, Pa. Manufacturing Plant

William H. Wagner, Plant Engineer of the Blue Bird Silk Manufacturing Company, knows the problems of generating high pressure steam 24 hours a day, 365 days a year. And he knows how serious it can be for a busy manufacturing plant if there is trouble or failure in the boiler room. That's why, two years ago, the company replaced their old-fashioned coal-fired boilers with two 200 h.p. POWERMASTER packaged automatic boilers, burning #6 (Bunker C) oil. Here is what they found:

- The cost of producing steam for processing and heating dropped 20%.
- · The steam produced now is much dryer.
- The POWERMASTERS respond very rapidly to variations in load.
- Maintenance has been negligible.

Little wonder that Alfred J. Sidler, Plant Manager, says, "If we had it to do over again, we would certainly buy POWERMASTERS."

No other packaged automatic boiler gives you all 3 advantages of the Powermaster:

- SAVE FUEL—because the special Powermaster burner design gives you top efficiency when operating anywhere between 30% and 100% of capacity.
- SAVE IN MAINTENANCE and clean-up time. Complete combustion of fuel gives practically smokeless and carbon-free operation. The burner has no moving parts to wear out... or to be cleaned daily.
- CHANGE FROM OIL TO GAS (or gas to oil) in just a few minutes. Burn light oil, heavy oil, or gas—whichever is cheaper. You no longer need depend on one source of fuel supply.

Write for this Catalog

To get complete information about this modern packaged automatic boiler for steam or hot water, write for *Powermaster* Bulletin 1218. We'll be glad to put a copy in the mail for you.





These 200 h.p. POWERMASTER packaged automatic boilers have been operating round-the-clock for more than two years at the Blue Bird Silk Manufacturing Company, York, Pa. Burning #6 ail, they produce a total of 13,800 pounds of steam per hour.

OWERMASIER

PACKAGED AUTOMATIC BOILERS
In sizes to 500 h.p.; pressures to 250 psi.

& SEMBOWER, INC.

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910 Morgantown Road, Reading, Pa.



ELOCITY PRESSURE TO STATIC PRESSURE Performance ratings of the Prat-Daniel F-D Fan are estab-

> blished according to the Standard Test Codes adopted by N.A.F.M. and the A.S.H.V.E.



How P-D split wheel assists diffusion— aids distribution throughout the fan.



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Design characteristics provide unusually high conversion of Velocity Pressure to Static Pressure. This is accomplished by streamlined inlet cones that are larger in proportion to the wheel than are usually found in forced draft fans. The unusual depth of the cones provide a wider housing than would customarily be used, increasing the space available for diffusion. Precisely fashioned backward curved blades provide a nearly perfect aerodynamic flow across both leading and trailing edges. Double wheel fans are spaced apart to permit four way diffusion of air, further contributing to this conversion. Peak efficiency and horsepower curves fall well within normal fan selection range, offering the optimum in maximum efficiency and non-overloading characteristics.

These are all carefully researched features that have made the Prat-Daniel F-D Fan a highly efficient apparatus. Check these features before you decide on your next fan. Write for catalog No. 300 today.

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Designers and Manufacturers

PRAT-DANIEL CORPORATION

SOUTH NORWALK, CONN

DEVELOPMENT | plant troubles (continued)

present when the initial adjustments were made. Following this. the screens are checked daily and the indicator readings logged. Any appreciable change noted over a period of time is then compensated for by use of the take-up bearings.

Prior to the installation of the springs, the headshaft of one of the screens became somewhat misaligned. The bending of the takeup rod, brought about by this misalignment, coupled with the vibration and the brittle metal from which the rod was made eventually caused it to fail. The net result was that the headshaft dropped far enough to let the chain leave the foot shaft sprockets and the screen had to be unwatered to make the necessary repairs. This brought about the development of the clevice arrangement shown in Detail "C".

When the springs were added the need for the clevices became even more apparent. It can readily be seen, that by adjusting for chain wear by positioning the footshaft, the headshaft can become appreciably misaligned if one chain should wear more than the other.

Other Modifications

While it is not shown in the drawings, we have also added stops with jack screws below the take-up bearings. This was done in anticipation of someday having to repair or replace one of the springs or take-up rods with a screen in service.

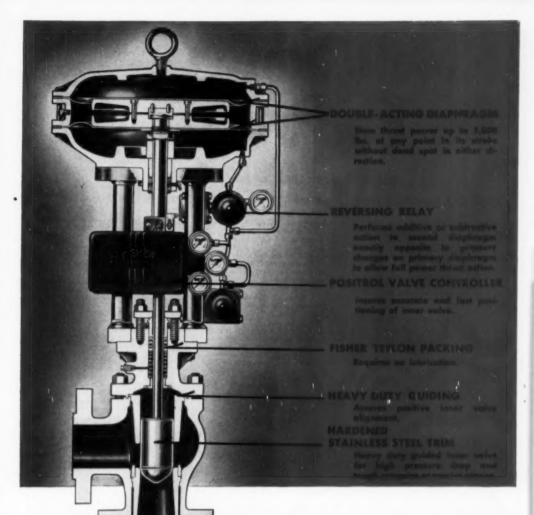
The repair or replacement of any of the above parts will be done by simply raising the jack screws until they support the bearing. The part to be repaired may then be worked on without affecting the operation of the screen.

Another advantage of the jack screws, is that by keeping them up to within 1/2 in. of the bearing we are automatically guarding against the dropping of a screen should any of the suspending members fail.

We have also added overload relays, ammeters, and annunciators to the screen control circuits.

The ammeters were added to the





TO OPEN or CLOSE SINGLE SEATED VALVES UNDER HIGH PRESSURE DROP CONDITIONS

Fisher Type 5700-458 "AMT" pressure balanced diaphragm motor valve will actuate large single-seated valves for tight shut-off on high pressure drops. It features full pneumatic performance — no springs, no levers or weights. Double diaphragm avoids backlash effects probable with single diaphragm construction. Develops up to 5,000 lbs. stem thrust with 30 lbs. air supply. Designed for fast stroke action. Fully strokes inner valves in 13 seconds.

WRITE TODAY FOR BULLETIN E-5700

PRESSURE DROP CONDITIONS

DIAPHRAGM MOTOR VALVES FOR HEAVY DUTY SERVICE

* AMT "Answer Me Twice". In action, pressure added to one diaphragm, subtracted from other.

FISHER GOVERNOR COMPANY

Marshalltown, Iowa

Revolutionary Performance!

Riley Boiler Unit gives bonus of 20,000 pounds per hour of steam to Masonite Corporation

Here's the maximum capacity guar-anteed to Masonite by Riley Stoker Corporation:

50,000 lb. continuous 60,000 lb. for 15 min. peaks

And here's the Masonite report on performance: "For the past 75 days the average hourly load on the new boiler has been 70,000 pounds with peaks of one and more hours' duration of 75,000

This same installation called for a guaranteed air heater gas temperature not in excess of 395 degrees at 50,000 pounds of steam per hour. In actual operation at 54,500 pounds of steam per hour, the air heater exit gas temperature was only 377.5 degrees!

No wonder Riley Stoker Corpora-tion, Worcester, Massachusetts, is so well known among leading plants throughout the nation for the highly efficient performance of its boilers!

Coppus-Dennis FANMIX Burners Were installed

To assure such revolutionary performance, Riley specified Coppus-Dennis FANMIX Burners for its boilers. The exclusive FANMIX action Riley on all Coppus burners, gas as well as combination gas-oil - is the reason for such performances.

FANMIX : Better Combustion : Better **Efficiency**: Higher Ratings

FANMIX burners, with their revolving orifices, give violent mechanical mixing and agitation of gas and air and, therefore, instantaneous and complete combustion with minimum excess air (5% excess air not unusual).

Furnace space is not required for mixing; therefore, higher boiler ratings are easily obtained.

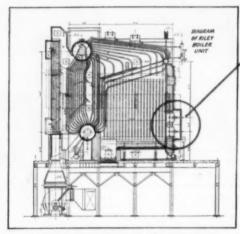
FANMIX burners, with shorter flame than any other burner, cannot cause flame impingement. FANMIX burners, incorporating a fan as an integral unit, have no draft loss across the burner. Therefore, regardless of draft conditions, increased ratings are possible.

FANMIX action, with its quick completion of combustion, gives lower exit gas temperatures.

Plan now to take advantage of Coppus-Dennis FANMIX action with your present boiler. Remember - no forced draft equipment nor increase in stack nor increase in furnace volume is required. for FANMIX operation to get increased capacity. And on new boilers, FAN-MIX lets you plan on reduced combustion space, higher ratings, less stack height or reduced induced draft capacity, and no forced draft equipcapacity, and no forced graft equip-ment. Mail coupon today. Sales offices in Thomas' Register. Other "Blue Ribbon" Products in Chemical En-gineering Catalog, Refinery Cata-log, Best's Safety Directory, and Mining Catalogs.



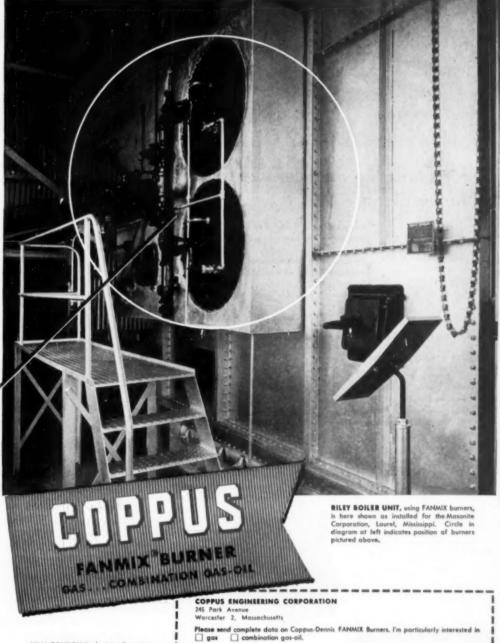
JET REACTION is utilized to rotate fan which is integral part of burner. Automatically proportioned high velocity air passes at right angles through fuel to create ideal mixture for fast, complete combustion and peak efficiency.



Well-Known Users of Riley Units with FANMIX Burners Include:

Publicker Commercial Alcohol Co. Eagle-Picher Lead Co. Mansanto Chemical Co. Humble Oil & Refining Gaylord Container Corp. Commercial Solvents Corp. Celanese Corp. of America Gulf Power Co. Mississippi Power Co.

Humble Oll & Refining Co. Godchaux Sugars, Inc. Kennecott Copper Corp. Nicholson File Co. Bird & Son, Inc. and many others



SEND COUPON for further information. Coppus engineers FANAIX burners to your individual requirements.

PLEASE ATTACH THIS COUPON TO YOUR COMPANY LETTERHEAD

Title

Company...

Address

City

Zone State



to insure

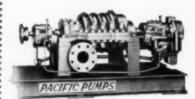
Reliability . . . Durability . . . Resistance to Corrosion-Erosion

Dependable Performance and the Highest Factor of Availability at All Times

Pacific

MULTI STAGE TYPE JBF

Capacities To — 1000 GPM
Discharge Pressures To — 1000 psi
Electric Motor Drive To 3600 RPM
Steam Turbine Drive To 5000 RPM
Speeds To — 10,000 RPM



··· Pacific

STEAM TURBOPUMP

Copacities To — 500 GPM
Discharge Pressures to 1100 pai
STEAM To 900 pai Pressure — 850° F. TT
Exhaust Pressures To — 50 pai
Speeds To — 10,000 RPM



PACIFIC
Precision; Built

Pacific Pumps inc.

HUNTINGTON PARK, CALIFORNIA Export Office: Chanin Bldg., 122 E. 42nd St., New York Offices in All Principal Cities

BF-15

plant troubles (continued)

circuit to give the operator an indication of the load on the motor. He then has a better idea of the amount of trash that the screens are bringing up, and can govern the speed of the screens accordingly.

The overload relays coupled with the annunciators give the operator an alarm at any time the screens trip out or stop for any reason.

At the present time we have equipped three screens with all of the above modifications, and have made provisions to modify three more screens.

The first screen to be modified has now run continuously for approximately four months, with no appreciable wear. While it is to be understood, that this is by no means conclusive evidence that we have solved our problems, we have definitely satisfied ourselves that the screens are running smoother than ever before. There is none of the jerking or uneven travel that had previously existed. Thus, we are sure that we have lessened the impact loads which were being taken by the driving mechanism. Also we feel that by knowing the exact location of the footshaft we can better control the tension on the chain at all times and save wear

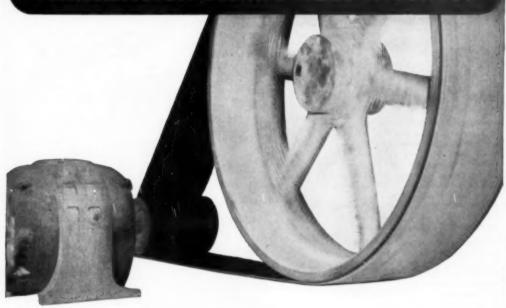
Close Up Those Floor Openings

A COMMON problem confronting almost any master mechanic is that of properly covering openings in floors around such machinery as dye kiers, bleach kiers, and other units requiring room for the original installation and also for subsequent expansion and contraction during operation.

Frequently, a 2 or 3 in. opening remains around the machine. Dye houses, for instance, are full of various machines installed through the operating floor.

Our Roanoke Mills No. 1 maintenance overseer, S. S. Smith, noticed an excellent solution to this prob-





Republic's Challenger Transmission Belting distributes power more efficiently because it's built of pre-stretched, hard-finished rubber-impregnated fabrics with non-slip "frictioneered" surfaces.

Republic's Challenger withstands heaviest shocks and stresses, flexes easily at

high speeds over the smallest pulleys.

Free yourself from fastener trouble, belt slippage and premature belt failures. Ask your Republic Distributor how Challenger applies to your job requirements or write direct for full facts.



THE FOSTER 50-G2 Pressure Reducing Regulator

IS A NATURAL

It combines extremely close regulation and high inlet-to-outlet ratio, under varying loads — approaching instrument control — with the freedom from trouble, long life and easy maintenance of a regulator.

Here's Why:

Although the new 50-G2 is single-seated for tight shut-off, it has the throttling action of a double-seated valve. Full balanced pilot valve and short travel of operating steam to the main valve piston cut the lag in response, for extremely close following of the demand. Yet overtravel, flutter and chatter are eliminated by the mass of the piston, stabilizing multi-rings, and unrestricted area under the piston.

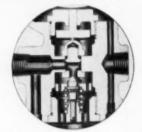
Pilot valve opening with the flow minimizes deadhead loss, and permits higher inlet-to-outlet ratio, for instance, 250% to 25. May eliminate intermediate stage in low pressure applications such as deaerating water heaters, tank storage heaters and auxiliary exhaust systems.

All wearing parts are of stainless, corrosion and erosion resisting materials. New alloy metals mean less wear.

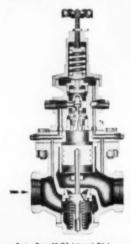
No special tools are needed servicing, and no outside media are required for operation.

Available for initial pressures 25–1200 P.S.I.G.; temperatures to 950°F; reduced pressures from controlled vacuum of 15" HG. to 600 P.S.I.G. with minor changes in top assembly; sizes ½" to 12"

For full information, ask for Bulletin G-101.



50-G2 Auxiliary or Pilot Valve Uni



Faster Type 50-G2 Internal Pilot Operated Pressure Reducing Regulator with Standard Top Assembly

OSTER ENGLNEERING

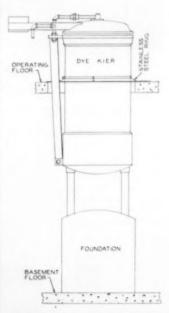
PRESSURE REGULATORS. RELIEF AND BACK PRESSURE VALVES. CUSHION CHECK VALVES.

ALTITUDE VALVES. FAN ENGINE REGULATORS. PUMP GOVERNORS. TEMPERATURE
REGULATORS. FLOAT AND LEVER BALANCED VALVES. NON-RETURN VALVES. VACUM
REGULATORS OR EREAKERS. STRAINERS. SIRENS. SAFITY VALVES, FLOW TUBES

plant troubles (continued)

lem while visiting another textile mill and immediately put it to use. It is very simple and most effective. Stainless steel rings were fitted snugly around the sides of the machinery involved as shown in the sketch.

Several specific benefits have been derived from this installation. A cleaner dve house basement has resulted since there are now no convenient openings through which to throw trash when cleaning the floor above. Men working in the basement are protected from injury by tools or fittings carelessly dropped through the openings. The dve machine operators are now much more careful not to allow the dye liquid to overflow as it will now run out on the floor around their own feet rather than draining into the basement and causing excessive deterioration of machinery which occurred previously. The overall appearance of the main operating floor is much improved by closing over the openings around the machines.-Robert J. Tucker, Jr., Plant Engineer, Roanoke Mills Company, Roanoke Rapids. N. C.



Rings fit machine snugly, yet allow it to move with respect to the floor.

NAVCO "Universal" PIPE SUPPORTS



Vertical adjustment up to 21/2 inches can be made.

Support may be turned to any angle of 360°.

Will take care of 8 inches of travel.



Features

Universal Pipe Supports hold the pipe down as well as up. They prevent pipe from getting out of alignment, which is usual when Roller Supports are used.

They permit control of expansion movement and insure the desired free action of Slip Expansion Joints so essential in tunnel and duct work.

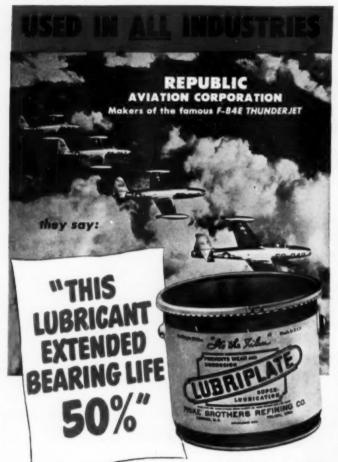
Expansion movement of pipe will not disturb the insulation.

Made in Cast Iron or Steel and provided with forced lubrication for lines exposed to the weather.

NAVCO PIPING

NATIONAL VALVE & MANUFACTURING COMPANY - PITTSBURGH, PA

NEW YORK . CHICAGO . CITTELAND . BOSTON . ATLANTA . TUISA . BUFFALO . CINCINNATI



To quote from a report of their Engineering Department

"Under actual tests, LUBRIPLATE extended bearing life fifty per cent or better as compared to other lubricants tested at that time. It was also found that, during test, LUBRIPLATE increased efficiency of machines twenty per cent by reducing friction loss. Republic has been using LUBRIPLATE successfully for the past eight years."

LUBRIPLATE Lubricants are different from all other lubricants with properties all their own. They reduce friction and wear, prevent rust and corrosion and save power.

LUBRIPLATE Lubricants are available from the lightest fluids to the heaviest density greases. There is a LUBRIPLATE Product best for your every lubrication requirement. Let us send you case histories of savings that others in your industry are making through the use of LUBRIPLATE Lubricants. Also

a packed in handy tubes for use in portable tools, guns, fishing reels, lawn mowers and household appliances.

LUBRIPLATE DIVISION

Fiske Brothers Refining Company Toledo 5, Ohio Newark S. N. J.

Dealers Everywhere . . . Consult Your Classified Telephone Book

LUBRIPLATE The Modern

plant troubles (continued)

Oil Cup Regulation

MANY needless steps are saved when oiler sets glass cups at corresponding flows where all will require filling at the same time.

In instances where more oil is required at one place than another, larger cups may be installed, and this "one trip" procedure may be employed .- C. W. Brewer, engineer, Anderson, Tully Co., Vicksburg, Miss.

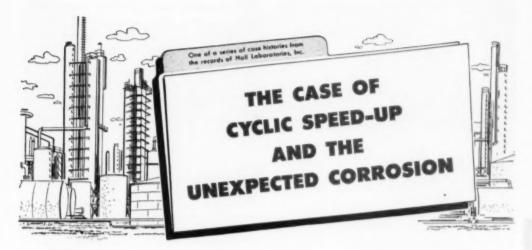
Plant Water System **Check Saved Money**

AN occasional bit of trouble often causes us to look critically at something we take for granted. Often considerable improvement may result from this critical survey.

One warm spring day the plant cooling water temperature became abnormally high, and, not being too familiar with the plant water system, a trip to the spray pond was made. The chart on the wall showed the sprays had been operating continuously, yet a thermometer in the inlet to our cooling system showed a higher temperature than the water being sprayed.

A further check revealed that the pond had not been changed over from winter operation, and a portion of our hot waste water was being fed directly to the pond. Changing a baffle in the return line fixed this but still did not explain why the temperature of the "hot well" was so cool.

Further exploration revealed that one return line from a bank of transformers was abnormally cold. There was also considerably more flow than there should have been, and this was where we really got to the bottom of the cause. An air washing system had been installed in one of the buildings in the neighborhood of the transformers and the waste water from it had been sent back to the hot well. The air washing system was merely a bank of sprays to cool and humidify the air and it was using considerable water. This water was already as cold as it could be made by spray-





This industrial process involved thermal refining of a vegetable oil. The batch-processing plant functioned by shooting steam through a heat exchanger, following this with water for cooling. So to process more oil without building a new plant, the hot-to-cool cycle had to be repeated more times per day.

The plant Engineering Department worked out a method of speeding up the cycle by using extended-surface tubes in the exchangers. For a time, the new system worked well but soon production slumped because of repeated failures due to corrosion.

The men in the Engineering Department had relied for years upon the Hall System of Boiler Water Conditioning in connection with the power plants of the company. They knew, furthermore, that Hall Laboratories had broad experience with all kinds of industrial water problems. So they brought their new problem to Hall for a cooperative appraisal.

On the basis of the facts presented, Hall engineers at headquarters suggested both mechanical changes—improvement of deaeration and redesign of headers to get better flow—and chemical treatment—a few parts per million of amine in the steam, a few parts per million of Calgon in the water. In the field, Hall engineers followed through by checking actual conditions at intervals. As a result of this complete engineering approach, corrosion was greatly reduced and the processing units now stay in production.

Let Hall Laboratories tackle your specific water problems. Clip the coupon for more information.

HALL LABORATORIES, INC.

(A SUBSIDIARY OF HAGAN CORPORATION)

CONSULTANTS ON BOILER WATER CONDITIONING;
PROCUREMENT, TREATMENT, USAGE AND DISPOSAL OF INDUSTRIAL WATER

| Hall Laboratories, Inc., Hagon Building, Pittsburgh 30, Pa. Please send me your bulletin: Let's Consider Your Whole Water Problem. | | | | |
|--|--|--|--|--|
| Name | | | | |
| Position | | | | |
| Company | | | | |
| Street & Number | | | | |
| City Zone State | | | | |



Yes, 3 square feet of heating surface with Cyclonic Combustion equals the 5 square feet of heating surface offered to you by other packaged boiler units.

The Cyclotherm Cyclonic Combustion Principle is an entirely new and amazingly different method of heat transfer in the boiler industry.

Air enters the combustion chamber at extremely high velocity in a revolving spiral vortex which travels the entire length of the furnace. The fuel is introduced into the entering air where it is slowly consumed as it moves in a cyclonic motion down the combustion chamber. This highly luminous slow burning flame radiating heat to the fire tube through direct radiation and by convection, results in an unusually high rate of heat transfer.

Boilers are designed for oil or gas operation from 18 through 500 HP, 15 to 200 lbs. operating pressure. Full power operation from a cold start in 15 to 20 minutes. Savings up to 50% on maintenance. Guaranteed 80% efficiency.



When lurge installation requirements exceed 500 HP, sizable fuel sovings out to obtained by bartery installations. Based on an analysis of your steam requirements, a number of units would be recommended which collectively add up to your excellent than dense for the programment of the programment o



On one typical installation as shown above, a bettery of 200 HP Cyclothermo has saved over \$12,000 a year in fuel above. Maintenance and operational cost have been reduced to 73%.



CYCLOTHERM, DEPARTMENT 34, OSWEGO, NEW YORK

plant troubles and solutions (continued)

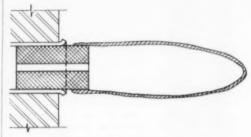
ing, so should not have been brought to the hot well.

The water sprayed in any such cooling device should be taken from the hottest water recovery source to provide maximum efficiency. Needless to say the cold water was rerouted into the pond and the hot well again became a hot water collector. Since the sprays were turned off when the pond temperature got low enough, a saving in operating expense was made.—

A. J. Humphrey, Tennessee.

Detecting Leaking Condenser Tubes

SURFACE condensers must be kept tight to prevent pollution of the condensate by circulating water. The detection of leaking tubes in large vertical condensers is sometimes a troublesome problem, particularly when it is not possible to fill the steam space with water. Even where water testing can be used the small leaks are sometimes overlooked.



The device shown was developed to detect leaks in vertical condenser tubes. It consists essentially of a single hole rubber stopper which fits the condenser tube snugly to which is cemented an old style rubber finger cot.

In practice, the lower ends of the tubes are sealed off by filling the lower water box with water so that the bottom four inches of the tubes are submerged. A partial vacuum is created in the steam space whereupon the maintenance crew each armed with ten of these devices goes over each tube end in the upper tube sheet. The ten testers are put in adjacent tubes in one row. No. 1 tester is removed and placed hext to No. 10; No. 2 is removed and placed next to No. 1 and so on until the row is completely checked. In this way each tester remains long enough in the tube end to detect a leak. A bad leak causes the finger cot to collapse instantly. A small leak may take thirty seconds or more to collapse the finger cot.—T. M. Johns.

New equipment and methods that improve maintenance only a little are of big value in overall plant operation. Check "New Maintenance Tools and Supplies" starting on page 8.

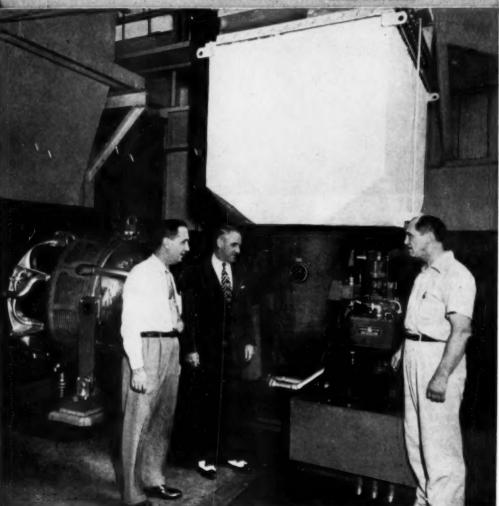


TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS, General Offices and Works: P.O. Box 485, Chicago 90, Ill. Offices in all principal cities. Plants at: Carnegie, Pa.: Fontane, Calif.; Hamilton, Ont., Canada

G-E Gas Turbine Maintains

"A duplicate unit is being



Donald S. Kennedy, President of Oklahoma Gas and Electric, inspects the 3500-kw combustion-gas-turbine at the Belle Isle Station with C. C.

Willis (extreme left) Superintendent of Generation at O.G. & E. and G. D. Conley (extreme right), Chief Engineer at Belle Isle Station.

Successful Record at Belle Isle*

"Surpassed Expectations" says Donald S. Kennedy, President of Oklahoma Gas and Electric.

The first combustion-gas-turbine to be placed in commercial service in America continues its record of successful operation at the Belle Isle Station of the Oklahoma Gas and Electric Company. On the line since July 29, 1949, the 3500 kw unit has established a record which has surpassed contract commitments for both capacity and economy.

Donald S. Kennedy, President of the Oklahoma Gas and Electric Company, hailed the unit as eminently successful. "The combustion-gas-turbine at Belle Isle has been easily operated and maintained by our regular plant personnel. Maintenance costs have been lower and kilowatt output higher than we had anticipated. The output has averaged well over 100 per cent. Availability has been consistently high with only thirty-seven hours forced outage, due largely to the failure of a lube oil pump impeller. For availability, economy, and capacity, our gas-turbine has surpassed expectations."

General Electric combustion-gas-turbines are available in both 3500 kw and 5000 kw ratings. For complete details call your nearest G-E sales office or write for Bulletin GEA-5516, "Gas Turbine Power Plants."

General Electric Company, Schenectady 5, New York.

11,823-HOUR INSPECTION REVEALS EXCELLENT OPERATING CONDITION

A routine semi-annual inspection of the Belle Isle gas turbine was held in March, 1951. This careful check-up on all original parts failed to uncover any major components—either rotating or combustion—which required replacement.



This half-section of the second-stage nozzle diaphragm had undergone almost no deterioration in twenty months of service. Its condition, typical of all diaphragm pieces, warranted no maintenance.



All six combustion chamber caps were reinstalled for further service. The discoloration around the gas fuel nazzle of this cap is a deposit of noncombustible residue from the fuel.



The compressor rotor, shown here with the top half of the cosing removed, had collected a slight amount of dirt but was otherwise in original condition.

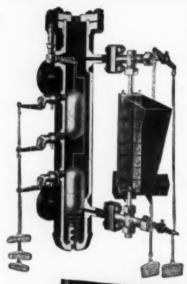
GENERAL



ELECTRIC

Reliance

Safety Water Columns ... your basic quide to Boiler Water Level Safety



• Keep your power plant from being the subject of a boiler insurance company report. Service without shutdowns from water level accidents can only be assured by constant alertness aided by modern safety devices.

Reliance Water Columns with positive, quick-acting alarms are made for pressures to 900 pounds. They're considered standard by leading boiler manufacturers, consulting engineers and government authorities.

For higher pressures, standard and custom-built equipment is available that embodies principles of design and construction perfected by Reliance in 68 years of specializing in this field. Specify Reliance for new or replacement Water Columns.



THE RELIANCE GAUGE COLUMN COMPANY 5902 Carnegie Ave. • Cleveland 3, Ohio

The name that introduced safety water columns....in 1884

plant troubles (continued)

Trouble Saving Kinks

Electronic Testing Leads:

Substituting phonograph-needle test leads for the conventional type furnished with electronic testing equipment, facilitates test procedures and saves time.

The sharp pointed needle easily penetrates wire insulation to touch the wire, and when removed does not affect the insulation. Time is saved because the wire does not have to be stripped and later re-

By using a clip on one lead, the point easily bites through any corrosion, dirt or paint on a metal panel or assembly to give a low resistance ground connection reference point.

The complete assembly described above can be obtained from any radio and electronic jobber.

Crocks for Mixing:

Mixing and dissolving water treatment chemicals, especially acid solutions for alkalinity reduction and chlorine compounds, is often done hit-and-miss by plant operators in any available container. Careless use of old buckets can introduce undesirable substances.

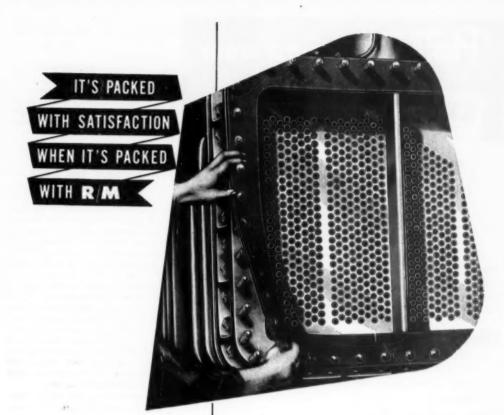
Substituting the familiar yesteryear home-brew earthenware crock is a most suitable solution to this problem, and has the added advantage that acids and oxidation materials do not affect the ceramic material. The large open top furnishes ample area for heat and fumes to be dissipated.

Costing under \$4.00 the 15 gallon size is ample for most requirements and can be conveniently filled. Often these inexpensive crocks in the 30 gallon size can be used to replace damaged rubber lined tanks, in power and process chemical mixing applications.

Marking Aid:

A number of pressure sensitive tapes are available for pen and pencil marking and are extensively used to identify wires, relays, terminals, coils and associated electrical equipment in control cabinets.

Another simple marking aid is medical type white adhesive tape. Written on with pen, pencil or type-





Whatever your packing problem . . . gaskets for a Freon condenser like this one . . . or packings for service against high pressures, high temperatures, chemicals, refrigerants, petroleum, milk or other special fluids . . . Raybestos-Manhattan has a packing or gasket designed for the job. Check your R/M Packing Catalog, or call your nearby R/M distributor.

PACKINGS

PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeoort, Conn., Manheim, Fa., No. Charleston, S.C., Crawfordsville, Ind., Fastoic, N.J., Feterborough, Ontario, Conada

RAYBESTOS-MANHATTAN, INC., Manufacturers of Pockings • Asbestos Toxisles • Mechanical Rubber Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Grake Blocks • Clatch Facings • Fan Belts • Rodiator Heas • Sintered Metal Products • Bowling Balts



is entirely covered by the long valve shaft, internally threaded to run on the screw. Liquid cannot touch the screw threads, cannot corrode them nor wash off their lubrication.

The valve disc

of gate valve type has an inserted rubber ring which operates like a windshield wiper on the valve seat as the valve is being closed. The disc can easily be taken out for replacement of the rubber ring after long use.



The wearing plate supplied for particu-

larly corrosive conditions, is simply a removable valve seat which can readily be replaced when required.



These are only some of the service-giving features of Twin Strainers. Get them all—write for the Twin Strainer Bulletin.

A-318

ELLIOTT COMPANY

Accessories Dept. . JEANNETTE, PA.
Plenis et LEANNETTE, PA. . RIDGWAY, PA.
AMPERE, N. J. . SPRINGFIELD, O. . NEWARK, N. J.
DISTRICT OFFICES IN PRINCIPAL CITIES

writer, it will stick to every surface including many that most pressure tapes do not adhere to satisfactorily.

A typewriter will make uniform markers; and when covered with cellophane tape, the complete marker is legible and permanent.—L. W. Fitzpatrick, Chief Engineer, Department of Corrections, Jefferson City, Missouri.

Electric Eye Door Failed to Operate

LMOST any plant having electric eye doors installed has run into difficulty with the operating beams located out-of-doors. Such was the case at Patterson Mills Company where the bright early morning sunlight during summer months prevented normal opening and closing of the doors. All attempts to increase the sensitivity of the photoelectric relays proved futile due to the overpowering brilliance of the sunlight. Even hoods installed to shade the receiving lens from the direct sun rays proved ineffective due to reflected light from surrounding areas.

This difficulty was finally eliminated by the installation of a more intense light source. The small bulb supplied with the equipment was replaced by a high intensity sealed beam unit similar in design to that used on automobile headlights. The result was a greatly increased intensity of the operating beam, thus allowing the photo-electric relay to more accurately detect interruptions of the beam.

In our case, the new light source was supplied by the manufacturer of the electric eye equipment and completely solved the problem. Any available light source, however, would be satisfactory, and within practical limits would have no serious effect on the life of the photoelectric tubes.—Robert J. Tucker, Jr., Plant Engineer, Patterson Mills Co., N. C.

Maintenance Aids

Check new tools, methods, and devices for on-the-job plant maintenance starting on page 8.

plant maintenance troubles and cures (continued)

Techniques for Attaching Duct Insulation

A TYPICAL problem, confronting the maintenance superintendent, both in commercial and industrial establishments, is the positive attachment of insulation material to various sizes and shapes of air or gas ducts.

The usual practice is to apply the insulation material by one or a combination of the following methods:

- Direct sticking of insulation to duct surface by the use of adhesives.
- Welding of impaling pins or wire tying lugs to duct surface.
- The use of sheetmetal screws, or other types of duct penetration methods.
- Attachment of supporting clips to duct surfaces by adhesives.

These methods have advantages when used only under specific and limited conditions.

Most adhesives have definite temperature limitations, usually below the average industrial requirements, and definitely cannot be considered as a positive method of attachment. Adhesives also require some other type of supporting agent, at least, advantages become apparent: Increased resistance to gas flow; creation of gas or air leakage points; and high velocity gas flow creating disturbing noises, making acoustical treatment as well as insulation, a necessity.

Probably one of the most satisfactory methods of positive attachment of impalement type insulation materials such as Air Cell Boards. blanket or other semi-rigid materials, is by the use of die-cut strapping. Regular strapping commonly used for the ordinary banding of insulation materials in place, is punched on variable centers. The distance apart of punch points is dependent on type of insulation used and duct size. When punched, strap is left with fingers, length of finger adjusted according to insulation thickness.

These fingers form the actual insulation support, and give the advantage of no duct penetration and positive holding. The strap is merely drawn tight about the duct perimeter with ordinary band stretching machines and sealed at the pull up point or points in accordance with established standard practice.

Strap attachment method for duct insulation material is applicable to round or rectangular ducts and other types of equipment. Sketch shows strap use on square duct.

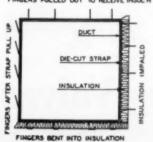


SHOWING FINGERS AT RIGHT ANGLES TO STRAP
FINGERS PULLED OUT TO RECEIVE INSUL'N

to hold insulation until the adhesive has taken proper set.

The welding of impalement pins and lugs to duct surfaces is limited in its use by the thickness and type of duct metal and is a relatively slow and expensive method of attachment.

When sheetmetal screws or other types of duct penetrating attachments are used, the following dis-



After the insulation is impaled on fingers, the fingers are bent so as to form two right angles, one leg running parallel to surface of insulation and the other perpendicular thereto and penetrating the insulating material. If the insulating material is of the type where the strap finger has a tendency to pull through, a bearing disc of area dependent on actual requirements, can be placed between strap finger and insulation, to eliminate this pull through tendency.

Strap spacing on duct is easily varied and can be done so as to allow a minimum of insulation cutting and fitting time.—William D. Parks, Allied Services, Inc., Charleston, W. Va.

Pump Trouble Found

ONE pump in a group of four similar units in a sewage booster installation had never quite lived up to the manufacturers' promises for efficiency. So we finally undertook a series of thorough checks to find the trouble. All of the pumps are the same vertical centrifugal, motor driven type.

Voltage and amperage readings were not quite comparable to the other installations, yet were not enough out of line to lend a clue to the trouble. Bearings were checked for wear and pump alignment proved to be ideal. It appeared that the foot valve could be the culprit. But that device was also found in good order.

Maybe you have guessed the answer by this time. The trouble had to be somewhere in the piping. It was an abnormally short nipple between the pump and the elbow above the vertical run of suction pipe that finally had to be changed. The presence of a 90 degree elbow right in front of the intake orifice. with only a 6 in. nipple in between resulted in a broken stream of water of high turbulence that caused noisy operation, heavy end thrust and general lowered efficiency of the pump. Lengthening the horizontal suction run to 7 ft. the same as its companions, brought the bad actor up to par with the other pumps in the group. - Paul Ziemke, Oak Ridge, Tenn.



BOILER BLOW-OFF VALVES

When you install an EVERLASTING Duplex Blow-Off Unit, you'll find that its many superiorities speak for themselves.

The sealing valve at the left is the EVERLASTING design that has been famous for more than 40 years... the valve with the drop-tight seal that actually improves with use because of its self-lapping action each time the valve is opened or closed... the valve that can't stick or jam because of its non-wedge design... the valve that opens in less than a quarter turn to provide unimpeded straight-through blow.

The blowing valve at the right is the equally famous EVERLASTING Angle or "Y" Valve, specially designed and equipped to withstand repeated blow-off shocks, erosion and corrosion, and without pockets that might trap and hold solids.

Each of these valves . . . and all the other EVERLASTING Boiler Blow-Off valve types, fully meet ASME code requirements . . . assurance that they are properly designed and amply strong for the service.

Write for descriptive bulletin

EVERLASTING VALVE CO. 49 Fisk Street, Jersey City S, N. J.



Fig. 4001/6571. Duplex unit consisting of Straightway Lever-operated Sealing Valve and Y Blowing Valve.



Fig. 6571/6561. Duplex unit consisting of Y. Sealing Valve and Angle Blowing Valve.



Fig. 6561/6571. Duplex unit consisting of Angle Sealing Valve and Y Blowing Valve.

Everlasting Valves

FOR EVERLASTING PROTECTION

Tools—Supplies for on-the-job Plant Maintenance

(Starts on page 8)

High-Heat Aluminum Paint

F-6
TROPICAL PAINT & OIL Co.,
1125 West 70th St., Cleveland 2, Ohio, has developed
a new maintenance paint to protect
metals subjected to temperatures in
the range of 200 F to 1000 F, called
"Thermalite."

The paint presents a clean, smooth, silver-bright finish. Applications include boilers, kilns, exhaust stacks, furnaces, melting pots, refinery equipment and laboratory apparatus.

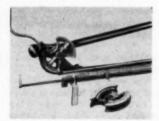
Thermalite differs from older types of aluminum maintenance paints in that it contains silicones, a resin compound created from a complex chemical treatment of quartz-like silica. In addition to its main function of preventing attack of rust and corresion on hot metal surfaces, the new paint offers excellent resistance to weather, chemical fumes and salt spray. According to the manufacturer, it will not discolor, blister, flake or burn off in temperatures up to 1000 F.

Versatile Conduit Bender

F-7

TAL BENDER, INC., 417 N.
Water St., Milwaukee 2,
Wis., is offering an economical tool for maintenance and repair,
known as the "Handy-Bendy" for ½
in. and ¾ in. rigid and thin wall
conduit.

Unit has measuring gauge and bend degree indicator to control bends being made on the job. No experience in bending is necessary to make any quantity of identical bends or offsets. The tool is said to assure against waste of pipe, and bad bends.



Tal Bender's Handy-Bendy handles ½ and ¾ in. rigid and thin wall conduit. Set height and degree of bend gauges as required. Slide conduit under former and pull handle one time. Release and bend is made. Available in bench and floor models.

Masoneilan No. 11 Reducing Valve

Now Better Than Ever!

For over 65 years, these Masoneilan steam reducing valves have been the standard for service-wise users. Now new refinements make them better than ever:

More sensitive and reliable. Superfinished parts practically eliminate sticking or corrosion.

Wider range of adjustment provides a greater selection of reduced pressure settings.

Sturdier construction. Possibility of damage is minimized.

Easier to service. All parts may be removed and replaced with the valve in the line; integral pilot valve aids assembly.

And maintenance now consists of little more than keeping the valve parts clean.

Call or write for more details about Masoneilan Regulators —We will be glad to help you select the best valve for your application.

MASONEILAN Regulators

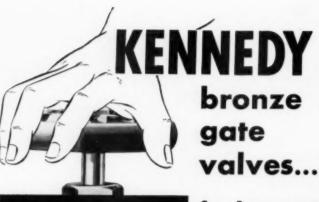
FOR STEAM . WATER . GAS . OIL



MASON-NEILAN REGULATOR CO. 1206 ADAMS STREET, BOSTON 24, MASS., U. S. A.

Sales Offices or Distributors in the Following Cities:

New York • Syracuse • Chicago • St. Louis
Tulsa • Philadelphia • Houston • Pittsburgh
Atlanta • Cleveland • Cincinnati • Detroit
San Francisco • Salt Lake City • El Paso
Boise • Albuquerque • Charlotte • Denver
Los Angeles • Appleton • Corpus Christi
New Orleans • Mason-Neilan Regulator Co.,
Ltd., Montreal and Toronto.



for low-cost maintenance

TO ASSURE DEPENDABLE OPERA-TION with minimum maintenance, the complete KENNEDY Line is job-fitted ... every valve specially designed and engineered for the job it has to do.

THE SIMPLE, STURDY DESIGN of the rugged KENNEDY Fig. 27 Bronze Gate Valve, for example, eliminates the small, quick-wearing parts that can cause frequent repair expenses.

EXTRA TIGHTNESS, without undue wear on the packing, is assured by an unusually deep stuffing box. Stripping of the stem and disc threads is practically impossible. Ribs cast on inside of valve body fit into channels in disc to maintain straight-line operation of all moving parts.

THE STUFFING BOX is provided with gland, and the valve can be repacked under pressure when wide open.

SCREWED BONNET AND WEDGE DISC are standard on the Fig. 27 in sizes from ½" to 3". Larger sizes are constructed with bolted bonnets and cam-type double discs with parallel seats. Working pressures ½" thru 3": 125 lbs. steam, 200 lbs. WOG, non-shock. 3½" thru 6": 100 lbs. steam, 150 WOG, non-shock.

shock. 3½" thru 6": 100 lbs. steam, 150 WOG, non-shock.

TO SAVE TIME AND TROUBLE, the Fig. 27 is job-fitted for easier installation, too. Wide, heavy pipe-end hexes have generous chamfer and precision threading . . . help you

KENNEDY Fig. 27, Branze Gate Valve,

125 lbs. steam, 200 lbs. WOG, non-shack

make tight connections quickly and easily.

FOR BEST RESULTS and real economy, standardize on KENNEDY Bronze Valves, and the complete line of KENNEDY Iron Valves, Malleable, Cast-Iron and Bronze Pipe Fittings.

WRITE FOR CIRCULAR 102 . . . BUY FROM YOUR LOCAL DISTRIBUTOR



THE KENNEDY

VALVES . PIPE FITTINGS . FIRE HYDRANTS

new equipment (continued)

For more data circle item code number on the postage free post card-p. 17

Compound Sets Anchor Bolts

F-8
THE HALLEMITE MANUFACTURING Co., 2446 West 25th St., Cleveland 13, Ohio, has developed a new quick setting cement for use with anchor bolts for permanently fastening machinery, hand rails, seats, or equipment of any type to concrete.



Hallemite's Por-Rok is simple to use—drill hole, set bolt in place, mix Por-Rok with water, and pour into opening around bolt. Latter is anchored permanently within 15-20 minutes.

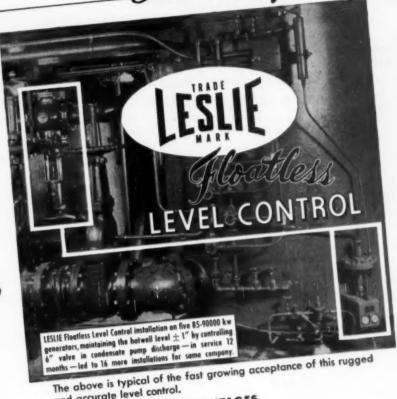
Applied cold, there is no heating hazard, and it rapidly forms a permanent weld-joint. The compound, known as Por-Rok is self-bonding, self-levelling, oil-resistant, and will not shrink. Laboratory tests show its compression strength to be 4500 psi.

Floor Surface Reinforcement

F-9
ACME STEEL COMPANY, 2840
Archer Ave., Chicago 8, Ill.,
announces the availability
in limited supply of Floor Plate, an
11%-in. square plate of .068-in. hotrolled steel designed for the reinforcement and protection of concrete floor
surfaces that are constantly subjected
to heavy industrial loads and severe
punishment.

Floor Plate can be quickly installed as a new floor surface or over old floors. No special tools are necessary for installation. Each plate contains 100 small rectangular holes approximately ½ x ¾ in. and 100 barbed prongs ¾ in. long. These prongs anchor the plate firmly to the concrete 100 times per square foot. The four rounded edges of each plate form a flange that becomes imbedded in the concrete and adds rigidity to the plate. Floor Plate has no sharp edges and cannot work loose.

For new floors, after a dry concrete topping mix is poured over the base slab and screeded, the plates are An Outstanding Record of Acceptance!



and accurate level control.

ADVANTAGES

- . EASY TO INSTALL
- ACCURATE REGULATION (±1" Water Column)
 - . NO FLOATS, STUFFING BOXES, ETC.
 - . MULTI-MEDIUM ACTUATED
 - . DIAPHRAGM PRESSURE ELEMENT
 - . ACTION REVERSIBLE

Applications: On open and pressurized vessels, including boilers, tanks, evaporators, heaters, standpipes, etc. PRINTED IN U.S.A.

SEND for illustrated Bulletin

Look for LESLIE Regulators under "Valves" or "Regulators" in your Classified Telephone Directory in leading industrial cities where LESLIE factory-trained engineers are located.

LESLIE CO., 261 Grant Avenue, Lyndhurst, New Jersey

PRESSURE REDUCING VALVES . PRESSURE CONTROLLERS . FLOATLESS LEVEL CONTROLS PUMP GOVERNORS TEMPERATURE REGULATORS

SELF CLEANING STRAINERS AIR HORNS

STEAM WHISTLES

FOR HEATING, POWER AND INDUSTRIAL PROCESS STEAM

KEWANEE

FOR

COTTAGE BOILER

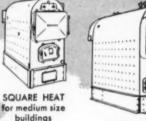
SCOTTIE JR.

HI-TEST 60 to 180 hp HEATING

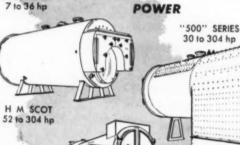
Jacketed ROUND "R" STEEL BOILERS

For more than three-quarters of a century the name KEWANEE has stood for the best in boilers . . . whether high or low pressure . . . for Heating, Power or Industrial Process Steam.

In sizes and types to produce 77,000 to 10,200,000 Btu hourly for low pressure heating . . . or develop from 7 to 304 horsepower . . . there is a Kewanee just right for the purpose.



TYPE "C" for large buildings



FOR

KEWANEE BOILER CORPORATION KEWANEE, ILLINOIS

ction of Anguery Regions & Stanfard Santiary convention

Sommy dame and industry

new equipment (continued)

For more data circle item code number on the postage free post card-p. 17



pressed into the topping until pillows of concrete extrude upward through the holes. Plates are then leveled with floor surfaces and each other with 2 x 4 lumber. Finishing, to remove excess concrete, is accomplished with the edge of a steel trowel or a piece of folded burlap to remove excess concrete.

Versatile Masonry Saw

F-10
THE CLIPPER MANUFACTURING COMPANY, Dept. 752, 2800 Warwick, Kansas City 8, Mo., has announced a new "Convertible" masonry saw.

The saw, which is actually both a wet (dustless) and dry saw, can be converted to both a concrete and track saw. At any time the cutting head of the Model HD masonry saw can be placed on the "convertible" (4 wheeled) cart. Equipment is then ready for sawing concrete or asphalt patches or trenches in building floors, drives and walks.

The conversion permits switching



Clipper Manufacturing Company's "Convertible."

"74.2% MORE STEAM PER DOLLAR-

that's what this modern coal installation gives us at Perfection Stove Co.!"



This view of Perfection Stove's new steam plant shows the coal elevator and ash silo. Coal is delivered through an under-track hopper, lifted by elevator to storage. A pneumatic system carries ashes to the silo.

If you operate your own steam plant, you can't afford to ignore these few down-to-earth facts!

COAL in most places is today's lowest-cost fuel.

COAL resources in America are adequate for all needs—for hundreds of years to come.

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

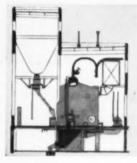
COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

says George I. Chittenden, consulting engineer for the Perfection Stove Company.

Perfection's old installation, if operating today, would generate 1,362 lbs. of steam per hour per dollar. The new plant produces 2,373 lbs. of steam per hour per dollar. Here's proof of the economy and efficiency of bituminous coal burned with modern equipment.





This sectional drawing of the plant's boiler installation shows the coal bunker over the firing aisle. A weigh larry with dustproof connection feeds coal to the stokers. The plant is clean and efficient-typical of the modern design that makes full use of coal's inherent advantages.

 More and more consulting engineers are advising their clients that bituminous coal is the best buy for steam fuel. Here's why: Nearly everywhere coal yields more BTU's per dollar . . . modern combustion installations step up this inherent economy . . . up-todate coal- and ash-handling systems cut labor costs to a minimum.

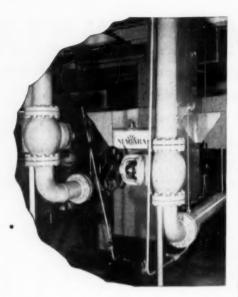
Tremendous reserves give coal a future dependability of supply no other fuel can offer. And to mine this coal, America has the world's most productive and efficient coal industry-making coal the one fuel most likely to remain reasonably stable in price.

If you're building or planning to modernize a steam plant, call in a competent consulting engineer. He'll show you how a modern coal installation can save you money and do a more efficient job, too!

BITUMINOUS COAL INSTITUTE

A Department of National Coal Association WASHINGTON, D. C.

FOR HIGH EFFICIENCY & FOR LOW COST YOU CAN COUNT ON COAL! How to get drier or cooler gases . .



NIAGARA AERO AFTER COOLER cools a compressed gas, or air, below the temperature of the surrounding atmosphere, thus preventing the condensation of moisture in your lines. The gas will contain only half of the moisture left in it by conventional methods. Even drier gas can be produced if you require it.

In working with controlled atmospheres of inert gases to prevent undesired reactions, this dryness of the gas at low cost is a great advantage. The cost of the Niagara method is low occause it uses evaporative cooling, saving 95% of the cost of cooling water (and its piping and pumping). This direct saving of cost pays for the Niagara cooler in less than two years.

If you use compressed air to operate tools or pneumatic equipment you save much in water and oil damage to tools and equipment, and in water damage to materials by using the Niagara Aero After Cooler.

Write for a bulletin, or ask nearest Niagara Field Engineer if you have a problem involving the industrial use of air.

NIAGARA BLOWER COMPANY

Over 35 Years' Service in Industrial Air Engineering

Dept. SP, 405 Lexington Ave.

New York 17, N.Y.

Experienced Field Engineers in Principal Cities of U. S. and Canada

new equipment (continued)

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from sawing glazed tile, concrete block, and fire brick to sewer, water or gas lines and floor patches in a matter of minutes. Fractures from jack hammer operations are now confined within the sawed removal lines plus the elimination of spalling.

By placing the "convertible" cart on tracks, a fourth use is accomplished. Stone slabs, Transite sheets, pre-cast stone, large refractories, plywood and masonite can be placed under the elevated tracks and sawed with this "convertible" track saw.

Powered Sweeper Designed as Lift Truck Attachment

F-II EGIANT PRODUCTS,
INC., 1531 N. Adams St.,
Peoria, Ill., has introduced
a new, low-cost powered sweeper,
which is designed as an attachment
to fit any fork lift truck of 1,500 lb
capacity, and up.

The "Yard Bird" sweeper, operated by the lift truck driver, can clean indoors and out, as rapidly as 80,000 sq ft per hr, with the truck traveling at 5 mph.

The attachment has its own selfcontained spray system for dust control. A 6.8 hp gasoline engine turns at 2,400 rpm, but an integral clutch reduction unit and sprockets step down brush revolutions to 164 rpm.

The new sweeper is of the pick-up type, with brush whisking dirt and refuse into a full-width floating dust pan. The pan is easily dumped for fast operation.



The "Yard Bird" power sweeper attachment of Little Giant Products, Inc. can be attached to the fork lift of a truck in 2½ to 3 minutes.



10 TONS OF PULP PER BLOW

Profitable production of high grade kraft, wrapping and bag, is evident at the Southern Division mill of the Hudson Pulp and Paper Corporation near Palatka, Florida. Operations began in 1947 and proved so successful that within three years new additions, designed to double the former output, were made.

Horton welded steel digesters have been serving the mill since it began operation. Originally four Horton digesters each having a capacity of 3320 cubic feet or 10 tons of pulp per blow were installed—and five more have been put into service with the recent expansion. Together these nine Horton digesters help keep production at a high level for the Hudson Pulp and Paper Corporation.

For more information about Horton digesters or other steel structures—and their application in the pulp and paper industry—write our nearest office. There is no obligation on your part.

Left: Looking up at one of the original Horton digesters installed at the Southern Division Mill of the Hudson Pulp and Paper Corporation. Below: Extension to digester building housing five Horton digesters at Hudson plant near Palatka, Florida.

Horton Equipment for the Pulp and Paper Industry

chip tanks...blow tanks...pulp tanks elevated water tanks...Marx Savealls sulphate and sulphite digesters . . . accumulators . . . acid tanks . . .

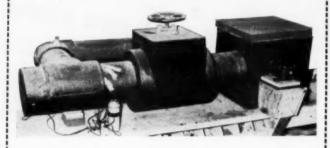


CHICAGO BRIDGE & IRON COMPANY

Atlante 3. 2180 Hoaley Bidg.

Birmingham 1. 1531 North Fiftieth 5t.
Besten 10. 1044—201 Devenskire 5t.
Housen . 402 Abres Bidg.
Chicage 4. 2107 McGarmick Bidg.
Chicage 4. 2107 McGarmick Bidg.
Cleveland 15. 2218 Cullidhell Bidg.
New York 6. 3312—165 Broadway Bidg.
Flants in BIRMINGHAM, CHICAGO, SALT LAKE CITY, and GREENVILLE, PA. in Conado—HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

ON THIS APPARATUS, 3" FOAMGLAS Pipe Covering was tested for a period of one year, cycling between minus 100° and plus 350°F. The test was designed to accelerate any deterioration that might occur under actual field conditions. A total of 52 cycles was completed, with no loss of insulating efficiency.



DUAL-TEMPERATURE TEST PROVED

"No loss of insulating efficiency"

Its ability to withstand hoth extremely low and high temperatures — over long periods of time—has won wide preference for FOAMGLAS among power and chemical engineers for low and dual-temperature requirements. It is being used successfully on piping, valves and fittings, heat exchangers, towers, tanks, boilers and other process equipment.

The insulating efficiency and durability of FOAMGLAS are due to its cellular glass construction, which prevents moisture and other harmful elements from getting into the material. So it will not get soggy, slip out of place, rot or shrink, as do ordinary materials which constantly need costly maintenance and finally have to be replaced.

Get the latest information on FOAMGLAS whenever you need insulation. Just send the coupon for a sample of the material and a copy of our authoritative booklet.

PITTSBURGH CORNING CORPORATION . PITTSBURGH 22, PA.



The best glass insulation is cellular glass. The only cellular glass insulation is POAMGLAS. This unique material is composed of still air, sealed in minute glass cells. It is light weight, incombustible, verninproof. It has unuvally high resistance to moisture, chemicals and many other elements that cause insulation to deteriorate.

Dops. AE-52, 307 Fourth Avenue
Pittsburgh 22, Pe.
Pirose send me, without obligation, a sample of FOAMGLAS and
your FREE beaklet on the use of FOAMGLAS for Piping and Processing
Equipment.

Name.

Address.

new equipment (continued)

per more data circio item code number on vas postage free post card-o. 17

Separator-Trap Mechanism

F-12

STRONG, CARLISLE & HAM-MOND Co., 1395 W. 3rd St., Cleveland 13, Ohio, is producing separating devices to be installed on air-using equipment to separate water and oil from the air at the point of use.

Compressed air carries suspended moisture taken from the air during the process of compression. As air is pushed through the lines, it drops in temperature, causing this moisture to condense into water. The combination separator and trap mechanism removes the moisture (and oil) from the air and drains it off just before it reaches the air-using machine.

Reinforcing Fabric For Roof Repairs

F-13

THE MONROE COMPANY,
INC., 10703 Quebec Avenue,
Cleveland 6, Ohio, have developed a new reinforcing fabric for
use with roof coating in repairing
roofs, stopping roof leaks and waterproofing areas around flashings, firewalls, chimneys and skylights.

Known as No-Rot, the membrane is composed of fireproof Fiberglas threads. It is impervious to rot and decay and exceptionally light in weight. It was developed for use with Monroe Rufferseal roof coating and Ruffersealit plastic cement, both regular and wet surface grades.



Monroe Company's No-Rot fabric can be fitted snugly around corrugated surfaces, pipes, and into sharp corners to form a tight, waterproof seal.

SERVE BUFFALO TRANSIT COMPANY IN 3-11/10VC

SERVE BUFFALO TRANSIT COMPANY IN





COMFORT HEATING-in winter. Four Dravo Heaters recirculate warm air over a 33,600 sq. ft. floor area in three integrated buildings . . . each heater has maximum air throw . . . provides uniform heat for personnel at working levels, despite opening and closing of doors to permit buses to enter and leave.



VENTILATING-in summer. Heater fans can be used alone to recirculate air and keep working conditions comfortable in hot weather. The Dravo Heaters are mounted horizontally and suspended from roof trusses to save valuable floor space.



DRYING-all year 'round. One heater, in addition to these other functions, dries buses with warm air as they come off the wash rack.

PITTSBURGH . ATLANTA . BOSTON . CHICAGO . CLEVELAND DETROIT . NEW YORK . PHILADELPHIA

Sales Representatives in Principal Cities

Manufactured and sold in Canada by Marine Industries, Ltd., Sorel, Quebec. Export Associates: Lynch, Wilde & Co., Washington 9, D.C.

DRAVO HEATERS OFFER YOU...

- Low initial cost—users report savings of 30% to 60% over standard "wettype" systems.
- Easy installation-no duct work . need only fuel, exhaust and electrical connections.
- Low operating cost-burns gas or oil . easily converted . . . minimum efficiency 80%.
- Long life low maintenance—rugged construction . . . stainless steel combustion chamber eliminates refractory
- · Heat where you need it-right in the working zone . . . roof heat losses re-
- Automatic operation—heater looks after itself . . . requires only occasional attention.

MAIL THIS COUPON FOR MORE INFORMATION ...

Heating Department, Dravo Corporation Dravo Building, Fifth and Liberty Avenues Pittsburgh 22, Penna.



I would like more information about Dravo Counterflo Heaters, Please send me Bulletin No. UV-523-2

| Name | | | |
|---------|------|-------|--|
| Title | | | |
| Company | | | |
| Address | | | |
| City | Zone | State | |

Combination Truck and Crane

F-14
THE ELWELL-PARKER ELECTRIC Co., 4205 St. Clair Ave., Cleveland 3, Ohio, has announced a new combination low lift platform truck and crane.

In addition to the standard 4000 lb capacity, self-loading platform designed to lift and transport skids, truck is equipped with a powered winch for pulling heavy loads on or off the platform. The boom which swivels 180 degrees, permits hoisting loads weighing up to 2000 lb. With this equipment, the truck is well suited for transporting maintenance material, machinery moving, motor or transformer placement, steam fitting and general plant repair work. The truck can also be used for lifting, carrying or positioning heavy, oddshaped loads such as castings, large assemblies, etc.



Combination low lift platform truck and crame of Elwell-Parker can help solve maintenance problems as well as handle production materials.

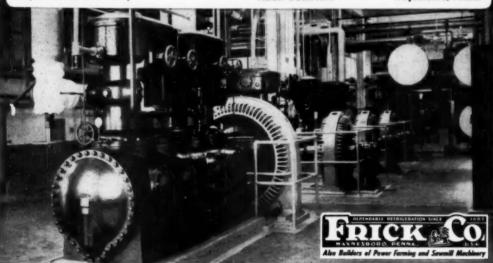
FRICK Refrigeration Serves Lucky Lager Brewing Co.

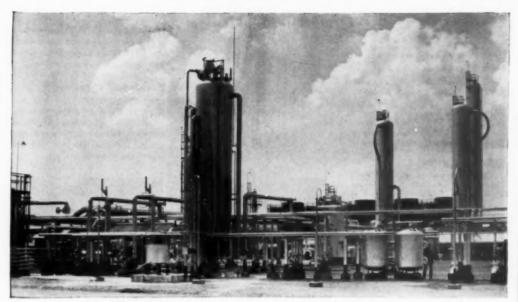
This Brewery in Los Angeles County, California, one of the finest in the country and one of three Lucky Lager Breweries on the Pacific Coast, uses four large Frick ammonia compressors with unusual reliability and economy in producing 700,000 barrels of beer annually.

Installation by Eckert Engineering Co., Frick Distributors at San Francisco.

For the answer to your air conditioning, quick-freezing, icemaking or refrigeration problems, look to

FRICK COMPANY • Waynesboro, Penna.





NORTH COWDEN GASOLINE PLANT near Odessa, Texas, operated by Stanolind Oil and Gas Company. Here Worthington Water Softeners protect boilers from scale-forming deposits.

Worthington softeners protect this plant's boilers 10 ways

In this case, it's a hot-process softener to remove scale-forming deposits from boiler feedwater.

Let's examine this gasoline plant installation and see how it gives boilers "maximum" protection:

- 1. Feed water is softened by a hot-lime soda system.
- 2. Selective deaeration for operation on makeup only, condensate only, or both.
- 3. Non-scaling direct-contact vent condenser heats and vents treated make-up.
- 4. Tubular vent condenser vents condensate.
- 5. Oxygen contamination of feedwater avoided by last-step deaeration.
- 6. Stainless steel deaerating elements.

- 7. Uniform and efficient deaeration during wide load swings.
- 8. Filter backwashing with clean, hot, chemically inert water without velocity change through the softening zone.
- Proportionate sludge removal.
- 10. Uniformly proportionate chemical feed.

Before you buy, investigate Worthington Water Softening Systems thoroughly. Tell us the service conditions, and get our recommendations in terms of dollars and benefits. Write Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Water Treating Section, Harrison, N. J.









Worthington Makes More of the Equipment for ALL Types of Water Conditioning Systems



New Maintenance Tools and Supplies (continued)

Electron Drill Removes Broken Taps and Drills

F-15

ELOX CORPORATION OF MICHIGAN, 740 N. Rochester Road, Clawson, Mich., has introduced the Elox Electron Drill, a hard metal drilling machine which accomplishes its cutting or drilling action electrically by creating a series of electric arcs which disintegrate the hardest metals.

The cutting tool or "electrode" is a hollow metal tube, usually of copper alloy in various diameters—which is chucked into the disintegrating head and held there firmly by a collet.

In removing a broken tap an electrode half the size of the broken tap is used. The head is lowered and the electrode centered about \(^1\) in above the tap. The operator feeds the head downward in the same manner as a drill press causing a series of electric arcs. In this way the electrode cuts down between the core and threads of the tap. A coolant is pumped through the hollow electrode, washing away the particles of metal. If the tap is through a hole, the core can be



Electron Drill of the Elox Corporation will salvage broken taps, drills, reamers, etc.

knocked out as soon as the electrode has cut its way through. If the tap is a blind hole the operator pulls out the core with a magnetized pick or tweezers.

When the core is removed the re-

maining threads can be picked or blown out easily. This same method is used on broken drills, studs, reamers, etc., without harming threads or wall, without sticking or welding.

Continuous "V" Packing

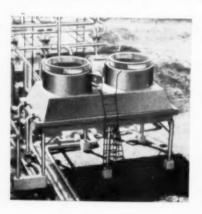
F-16

F-16

FLEXROCK COMPANY, Mechanical Packing Division, 3670-B Cuthbert St., Philadelphia 4, Pa., announces a new, continuous, chevron-type packing designed for 500-6000 psi.



Flexrock Company's Continuous-Vee packing is available in two styles.



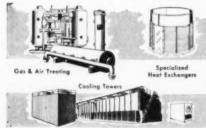


Only Thorough Engineering and Adequate Sizing Can Give You Pritchard Quality!

New Pritchard Type "B" QUINTAIR* Air Cooled Heat Exchanger

Pritchard quality means a lot when it comes to selecting air cooled heat exchangers. Take Pritchard's Type "B" Quintair for example. All parts requiring attention are readily accessible and easily serviced. Thoroughly engineered for long life and operating economy—adequately sized for top performance under the most exacting conditions—the Pritchard Type "B" Quintair can handle one or several different heat loads in a single compact unit. Whatever your cooling problem, it will pay you to investigate the Pritchard Type "B" Air Cooled Heat Exchanger. Write today for full information.

*Registered Trade Name



J.F. Pritchard & Co.

Dept. No. 193

908 Grand Ave., Kansas City 6, Ma.

District Offices: CHICAGO - HOUSTON - NEW YORK - PITTSBURGH
TULSA - ST. LOUIS - Representatives in Principal Cities from Coast to Coast



IF a parachute or a combustion control system doesn't work just right—the user is in for a loss.

A boiler burns millions of dollars worth of fuel during its service-life. A combustion control system which wastes as little as one per cent of this fuel will cost you many thousands of dollars—even five, six, or seven times what the control system itself cost. That is why only the best combustion control system is good enough. Hagan Combustion Control Systems utilize your fuel accurately, automatically, economically, dependably.

Hagan Corporation's engineers have extensive experience with all types of combustion control applications—a prime reason for their position of leadership. For more information write, wire or phone—



HAGAN CORPORATION

HAGAN BUILDING, PITTSBURGH 30, PA.

BOILER COMBUSTION CONTROL SYSTEMS
RING BALANCE FLOW AND PRESSURE INSTRUMENTS
METALLURGICAL FURNACE CONTROL SYSTEMS
THRUSTORO FORCE MEASURING DEVICES



furnaces are gobbling up an enormous amount of iron and steel scrap.

More-far more-scrap than is at present going into their scrap stockpiles.

Many mills are operating on a hand-to-mouth basis. Some are already threatened with shutdown-for lack of scrap.

The Danger Is Increasing

Will efforts to fill the tremendous demands for steel fail because of lack of scrap?

Steel is made from 50% scrap. We could be severely handicapped in our aim to keep abreast of both military and civilian requirements if scrap suppliers can't keep pace with productive capacity.

But they can keep pace . . . with your help!

Yes-the only problem is to get the available extra scrap from where it is - to where it's needed.

Where is it?

In your business . . . in the form of old machines and equipment, tools, implements, dies, jigs, fixtures, outmoded structures, chains, valves, wheels, pulleys-any old iron and steel that's rusting away.

Six Million EXTRA Tons Needed!

By the end of 1952, we'll be producing steel at an annual rate of 20 million tons more than in 1950. That means we will need at least 6 million more tons of scrap than we've ever needed before.

ft's up to you. Write at once to Advertising Council, 25 W 45 St., New York 19, N. Y., for a free copy of "Top Management: Your Program For Emergency Scrap Recovery". Please write today—there's not a day to lose.

NON-FERROUS SCRAP IS NEEDED, TOO!

This advertisement is a contribution, in the national interest, by



SOUTHERN POWER & INDUSTRY

Rust Preventive Paint

F-18

UNITED LABORATORIES, INC.,
16801 Euclid Ave., Cleveland 12, Ohio, has announced an improved formula for its
Certified Rust Inhibitor No. 425.

Outstanding features of this new rust preventive paint are that it will dry in 10 minutes under normal drying conditions and one coat provides excellent hiding of the old metal surface. It will withstand temperatures from minus 100 F to plus 250 F and is said to be exceptionally resistant to salt air and fumes.

The paint may be applied over damp surfaces, interior or exterior, galvanized metal and new or rusted metal surfaces of all kinds.

Concrete Paint

F-19 SMOOTH-ON MANUFACTUR-ING Co., 570 Communipaw Ave., Jersey City 4, N. J., announces a new concrete paint, Smooth-On No. 15, for use on interior or exterior concrete, cement block, brick and stone.

The product does not require any primers or sealers and can be applied to painted or unpainted, dry or damp surfaces. One gallon covers approximately 400 sq ft, and one coat is usually all that is required.

An important feature of this new paint is its high resistance to water, acid or alkaline attack. Surfaces can be washed without damaging the finish. Color is a medium gray.

Mica Undercutter for Slotting Commutators

F-20
Co., 1375 Hird Ave., Lakewood, Cleveland 7, Ohio, has introduced the Model H Mica-Miller undercutter, available with three interchangeable heads which make it possible to use the model with saws or "Y" cutters ranging from 23 /32 in. diameter to 1 1/4 in. diameter, for undercutting a wide variety of commutator sizes.

The tool is driven by a 1/5 hp Umversal ac-dc motor, with switch located in the handle. To-change from one size head to another, it is necessary only to remove one screw, change heads, and replace the screw. All three heads are equipped with depth gauges, the two smaller ones have slot guides, and the heavy duty head has roller supports.



Martindale Electric's Model H Mica-Miller is available with three interchangeable heads.

One-Man Electric Sweeper

F-21

G. H. TENNANT COMPANY,
2530 North Second St., Minneapolis 11, Minn., has introduced a new industrial floor
sweeper that operates at 4.7 mph and
has a 36 in. brush spinning inside a
special sealed-to-floor compartment.

As the brush revolves it flips heavy waste and dirt forward into a hopper; simultaneously a vacuum fan sucks lighter dust into a canvas bag. An optional 21 in. rotary sidebrush widens sweeping path by 32 and sweeps flush with walls.

The sweeper is powered by a 36 v, 8 cell battery. It will climb a 6½ degree grade, has automotive type steering, reverse gear, hydraulic brakes, and horn.

Indoor and outdoor electric sweeper of G. H. Tennant Company sweeps 20,000 to 60,000 sq ft/hr.



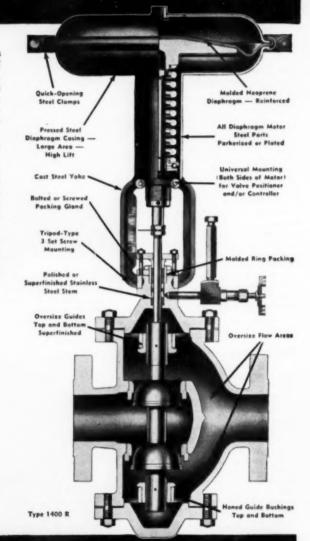
Why Most Leading Companies Are Using K & M Control Valves

It is logical that leading companies should handle the important subject of control valves as they do other matters: They make use of the best available skills and thinking. More and more, they utilize the equipment, knowledge and facilities of the K & M engineering and service team.

Five years ago, K & M Advanced-Type Control Valves were new to industry. Today, with outstanding performance records behind them, K & M valves have become first in the regard of many instrument engineers. Increasingly, K & M representatives are called upon to give counsel and assistance in the planning of new control installations and the improvement of old ones. During the past year K & M men have been consulted on most of the projects in which control valves have been a major consideration.

There is a qualified K & M representative near you, eager to discuss your problems and able to help you with them.







KIELEY & MUELLER, INC

Valve Makers Since 1879 2017—43rd STREET N

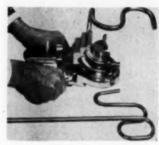
NORTH BERGEN, N. J.

new equipment (continued)

For more data circle item code number on the postage free post card-p. 17

Three-In-One Tube Bender

F-22 TAL BENDER, INC., 417 N. Water St., Milwaukee 2, Wis., is producing the Tal 3-in-1 tube bender, which will make offsets and bends up to 180° in %, ½ and % in. O.D. copper tubing, brass, steel and other light gage tubing.



No vise or fixtures are required with Tal Bender's 3-in-1 bender. Application: refrigeration work, radiant heat coils, maintenance shops, etc.

Tubing is bent with a ratchet type operation. The 5 lb aluminum alloy bender has no loose parts to assemble.

Scissors Type "V-Mop"

F-23

G. H. TENNANT COMPANY,
2530 North Second St., Minneapolis 11, Minn., has introduced a new scissors-type mop for
sweeping aisles of various widths.

As the mop is pushed across the floor, dirt and litter are forced into the "V" shaped pocket formed by the two mop heads. This allows con-



Opening and closing like a pair of scissors, G. H. Tennant Company's V-Mop allows operator to sweep a path from 6 to 57 in. wide.



new equipment (continued)

tinuous sweeping without loss of load, eliminating extra "passes" to recover spillage.

The angle at which the mop heads are set permits better dust pick-up per foot of travel. Removal of dust and litter from under machines, benches, etc., is possible without lifting the mop from the floor. The operator simply closes the mop-heads around the litter and draws it back to the aisle.

Special features include light-

For more data circle item code number on the postage free post card-p. 17

weight tubular steel handles, rubber grips, and careful balancing to make the new unit easy to handle. Fresh refills may be quickly inserted into the rust-resistant mop-arm controls.

High Clearance Scaffold

F-24

UP-RIGHT SCAFFOLDS, INC.,
1013 Pardee St., Berkeley
10, Calif., is manufacturing
a scaffold which will straddle looms,
spinning frames, and other machinery



Typical use of an *Up-Right* aluminum scaffold in the weave room of a textile mill. Working platform area is 4×6 ft.

BLAW-KNOX GRATING



Electroforged into rigid, one-piece panels.



Twisted cross bar prevents slipping.

BETTER SERVICE ON 5 COUNTS

1 SAFER FOOTING
2 GREATER STRENGTH
3 LONGER LIFE
4 LOWER MAINTENANCE
5 MORE OPEN SPACE

Bring your open steel flooring problems to Blaw-Knox for expert help, Bulletin 2365 sent on request.

Grating Department

BLAW-KNOX DIVISION of Blaw-Knox Company 2034 Farmers Bank Bldg., Pittsburgh 22, Pa.

BLAW-KNOX STEEL GRATING

obstacles, permitting production to continue while maintenance operations are in progress.

The scaffold is designed for oneman erection and operation, by following the manufacturer's step-bystep instructions: High-Clearance section (adjustable from 7 ft to 9 ft) is placed on ground with platform locating pins pointing up; lift top end frame and swing through 270 degrees; snap two diagonal braces in place: lift opposite end until right end frame is vertical; snap on diagonal braces, place platforms in position and adjust legs to level the scaffold; and proceed with these simple directions until the scaffold is ready for 1150

Bench Type Parts Cleaner

F-25
GRAYMILLS CORPORATION,
1960 Ridge Ave., Evanston,
Ill., has developed a new low
cost bench type parts cleaner, known
as the Brush-Flush, with fountain
brush action.

It features a hollow handle brush attached to the pump, with a tube, to produce a steady flow of clear solvent at the end of the bristles. Oil, grease, and dirt are flushed away as they are loosened with the brush. The company's UL listed solvent is used with the device; only three gallons required for one filling.

The cleaning solution flowing from the brush is always clear because of the double filtering arrangement. Parts are cleaned on the large screen platform. Small particles passing through the platform screen are retained by the baffle or second filter screen located at the pump intake.

A 21/2-gallon soak tank with dip basket, independent of the main tank, can be used with either the same, or a different solution.



Graymills Corporation's Brush-Flush can be placed on the work bench and plugged into any 115 volt outlet.

Engine Driven Sweeper

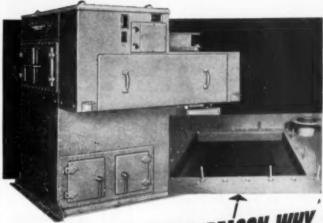
PARKER SWEEPER COMPANY, Springfield 99, Ohio has F-26 added two new enginedriven floor-sweeping machines to its line of hand-operated machines.

Drive is by a 1 hp, 4 cycle gasoline



Parker Sweeper's 1 hp. 4 cycle, engine driven unit for floors, 20 and 28 widths

YOU CAN'T BUY A BETTER COAL SCALE THAN A RICHARDSON



.. AND HERE'S ANOTHER REASON WHY..

INLET OPENING, 20" x 20"

This 400-square-inch opening, exclusive with Richardson, ensures positive coal flow and never a "hang-up"-even with wet coal. An even greater area at the conveyor belt, due to the angle of repose of the coal providing pressure relief, is a double guarantee of free flow. It is designed to guarantee the ultimate in dependable, on-the-job operation.

Write for bulletins. and remember . . .

YOU SPECIFY QUALITY WHEN YOU SPECIFY



RICHARDSON SCALE COMPANY Clifton, New Jersey

Atlanta . Boston Buffalo Chicago Cincinnati
Detroit Houston Minneapolis
New York Omahu Philadelphia
Pittsburgh Sen Francisco Wichits

Montreal * Toronto

B151

new equipment (continued)

engine mounted at the rear and connected by V-belt. Mounting is on semi-pneumatic tires. The shafts ride on ball or roller bearings.

The cylindrical brush in the main machine housing sweeps dirt and trash into a hopper secured by the housing. The hopper can be lifted out to dump the accumulated materials. Three types of brushes are available for various duties. A wall brush, increasing sweeping width by 6 in., can be added with belt connection to the machine.

Flexible Heating Cable

EDWIN L. WIEGAND Co., 7500 Thomas Blvd., Pittsburgh 8, Pa., has introduced "Thermwire," a new flexible electric heating cable consisting of a heavygauge nickel-chromium resistor wire with tough abrasion-resistant insulating sheath.

Thermwire protects roofs, gutters, and downspouts from accumulations of snow and ice; embedded in asphalt

For more data circle item code number on the postage free post card—p. 17



machinery housings Process wrapped with Edwin L. Wiegand Company's Thermwire and covered with insulation to prevent condensawith institution to prevent conditions from falling into material being processed below. Similar wrap-around installations prevent freezing and keep water and viscous fluids running in pipe lines under belowzero conditions.

or concrete, it melts ice from pavements; prevents freezing of pipes; and provides an easy solution in other applications where a portable, pliable, efficient heat source is required to cope with cold weather problems.

The product is made up in two packaged sets: one set is 80 ft long, 400 watts, 115 volts; the other is 160 ft, 800 watts, 230 volts. Each has a ten-foot cold lead section and plug.

Chemical Additive For Handling Leakage Problems

THE BUILDING MAINTE-NANCE DIVISION of the F-28 FLEXROCK COMPANY, 36th and Filbert Streets, Philadelphia 4, Pa., now has available a liquid chemical additive that makes a fast-acting leak-stopper out of ordinary cement or cement and sand.

Called Flextite, this material regulates the setting time for Portland Cement from 30 seconds to 30 hours, makes it possible to stop direct leaks almost instantly without removing hydrostatic pressure. The mortar is said to be equally effective as a waterresistant plaster coat that seals off seepage and excludes moisture, converting damp, wet basements, pits, etc., into dry work or storage spaces. Flextite mortar is also useful for pointing up spalled areas or covering exposed reinforcing bars or beams. Whether used as a leak-stopper or plaster coat, the mortar works on concrete, masonry or brick surfaces.



against defense production slow-ups

Now that the country's engines, conveyors, compressors, motors, hoists and other ma-chinery is running full tilt on defense production, good lubrication practice is doubly important.

Specific suggestions on lubricating methods that avoid "down time" for overhauling in-dustrial machinery will be found in the dustrial machinery will be round.

Albany Recommendation Chart. Ask your free capy. They Mill Supply house for a free copy. can provide the right Albany Lubricants for your equipment.

ALBANY GREASE

ALBANY BEARING LUBRICANT (Ball and Roller)

ALBANY GEAR LUBRICANT ALBANY PRESSUREGREASE

UNIVERSAL ALBANY PENETRATING OILS

FREE: Send for copy of Albany Recommendation Chart

ADAM COOK'S SONS, INC. LINDEN, NEW JERSEY



Albany LUBRICATING PRODUCTS



Flexrock Company's Flextite is a chemical additive that makes a fastacting leak-stopper out of ordinary cement or cement and scad. Will handle leakage problems in elevator pits, engine rooms, tanks, cable pits,

Tape for Splicing Large Power Cables

MINNESOTA MINING & MAN-UFACTURING Co., 900 Fau-F-29 quier St., St. Paul, Minn., has announced a new oil-resistant tape for rapid insulation build-up on splices in large power cables.

The chemical-resistant qualities of the tape make it especially suitable for use in oil drilling, mining and underground cable operations, while the 40-mil thickness and extreme stretch make possible smooth insulation wraps on irregular surfaces.

Since it fuses to itself, forming a solid homogeneous mass, it requires no adhesive. The tape is not designed as a sole insulation. The manufacturer recommends "Scotch" plastic electrical tape No. 33 as the outer wrap for protection against moisture, weather, and abrasion.



Minnesota Mining's electrical tape No. 25 provides greater dielectric strength and resistance to high tem-peratures than natural rubber.

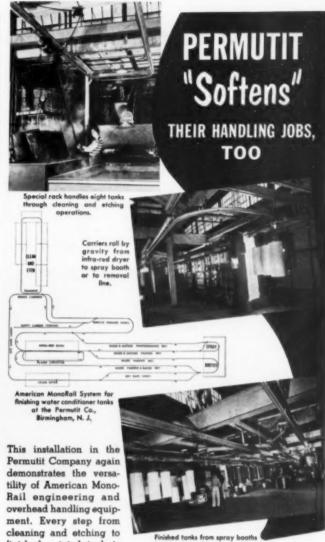
These tools, devices and methods for on-the-job plant maintenance are continued on page

Free Reader Service

New equipment and methods that improve maintenance only a little are of big value in overall plant operation.

Additional information on any of these tools, methods, devices, etc., for on-the-job plant maintenance is offered Southern and Southwestern industrial and power plant maintenance personnel.

Simply circle the item code number on the postage free post card on page 17. There is no obligation.



cleaning and etching to finished painted tank is done by a continuous

"flow" operation. The system boosted production, cut handling labor, improved space utilization, reduced material damage, bettered working conditions and improved production control.

(rear) rall to pusher conveyor in

American MonoRail engineers can show you how to increase production and lower costs in your plant. Just drop us a line.

SEND FOR BULLETIN

THE AMERICAN COMPANY

13106 ATHENS AVENUE

CLEVELAND 7, OHIO

NEWS for the South and Southwest

Cleaver-Brooks-Tenn., Ky.

THE CLEAVER-BROOKS COMPANY, 326 East Keefe Ave., Milwaukee, announces the appointment of the WIL-SON-WEESNER-WILKINSON COMPANY. 310 South 2nd St., NASHVILLE, TENN., as a manufacturer's representative for the sale of Cleaver-Brooks boiler equipment.

A. W. WEESNER is president and W. D. KERRICK is sales manager of the company. The firm will handle a territory that includes 37 counties in TENNESSEE and 26 counties in Ken-

Cleaver-Brooks manufactures equip-

ment for the generation and utilization of heat. Among its products are mobile steam boilers; oil-fired, gasfired and combination oil- and gasfired boilers: distillation equipment: hot water generators and bituminous heating equipment.

Leeds & Northrup-Atlanta

LEEDS & NORTHRUP COMPANY, 4901 Stenton Ave., Philadelphia 44, Pa., has opened a sales and service office at 3084 Grandview Ave., ATLANTA 5, GEORGIA. WILLIAM A. MACAN III is manager of the new office.

Mr. Macan was graduated from



William A. Macan, Manager of new Atlanta, Georgia, sales and ser-vice office of Leeds & Northrup

Haverford College in 1936 and immediately accepted a position with Leeds & Northrup at Philadelphia in their training course. He then started sales work in their Boston office and was later transferred to Cincinnati.

His present appointment at the Atlanta headquarters covers sales and service for South Carolina, Florida, GEORGIA, ALABAMA, MISSISSIPPI, and TENNESSEE.

FUTURE EVENTS Of Engineering Interest

NATURAL GASOLINE ASSOCIATION OF AMERICA, Wn. F. Lowe, Sec'y, 422 Kennedy Bildg., Tulsa 3, Okla. Apr. 39-May 2, Annual Convention, Rice Hotel, Houston, Texas

INTERNATIONAL POURTH EXPOSITION AND CONFERENCE, Lighting Exposition Management, 511 Terminal Tower, Cleveland, Ohio May 6-9, Cleveland Municipal Auditorium.

eveland, Ohio

NATIONAL ASSOCIATION OF PURCHAS-ING AGENTS, George A. Renard, Exec. See'y, 11 Park Place, New York 7, N. Y. May 25-28, 37th Annual Convention and Inform.4-Show, Atlantic City, N. J.

Oct. 19-21, 7th District, 9th Annual Co ference of Furchasing Agents of the Southeast, J. R. Carmichael, Conference Program Chum., Atlanta, Georgia

AMERICAN SOCIETY OF REFRIGERAT-ING ENGINEERS, M. C. Turpin, Sec'y, 40 W. 40th St., New York 18, N. Y., June 1-4, 39th Spring Meeting, Atlanta Biltmore Hotel, Atlanta, Georgin

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, A. V. Hutchinson, Exec. Sec'y, 62 Worth St., New York 13, N. Y. June 16-18, Semi-Annual Meeting, The Es-

x and Sussex, Spring Lake, N. J.

STOKER MANUFACTURERS ASSOCIA-TION, Marc G. Bluth, Exec. Seey, 307 N. Michigan Ave., Chicago I. III. June 27-28, Annual Meeting, South Shore Inn on Lake Wawasee, Syracuse, Indiam.

AMERICAN GAS ASSOCIATION, H. EMICAN GAS ASSISTANCE WORLD AVE., Wolff, Mang. Dir., 420 Lexington Ave., New York 17, N. Y. 2, 27-Nov. 1, Annual Convention, Auditorium, Atlantic City, N. J.



Carolina Steel & Iron Company-N. C. Celebrates Third-Century of Service

Here's the main structural shop of the Carolina Steel & Iron Company in Greensboro, North Carolina. The company re-cently issued an elaborate 76 page book depicting various phases of its operation and paying tribute to Salem Steel Company of Winston-Salem, N. C., an affiliate of Carolina Steel.

Carolina Steel was organized in 1919 with nine workers and an annual payroll of less Today, the Company has 290 employees and payroll of over one million dollars. In 1949, Carolina Steel expanded its capacity by the purchase of Salem Steel Company in Winston-Salem. Combined companies now fabricate over 21,000 tons of structural steel annually. Within their organizations, Carolina Steel and Salem Steel possess the facilities to fabricate steel for buildings, bridges, and miscellaneous structures out of rolled shapes, plates and bars.

N. P. Hayes is President of Carolina Steel and Iron Company and Salem Steel Company. Operating personnel at the Greensboro, N. C. plant of Carolina Steel and Iron are: T. P. Noe, Ir., Production Manager; S. R. Webb, Chief Engineer; and H. E. Miller, Purchasing Agent. Operating personnel at the Salem Steel Company in Winston-Salem are: Harry E. Crossley, Sales Manager and D. E. Angel, Purchasing Agent.

Sterling Electric Motors New Orleans Sales Office

STERLING ELECTRIC MOTORS, INC., of Los Angeles, has recently opened a sales office at 12 San Jose Ave., NEW ORLEANS 21, LOUISIANA, with



I. D. Trice, Manager of the New Orleans, La., office of Sterling Electric Motors

J. D. TRICE as manager. Mr. Trice is an experienced application engineer and is well acquainted with the industrial requirements of the area.

A. P. Green Fire Brick, Ala.

THE A. P. GREEN FIRE BRICK COM-FANY, MEXICO, MISSOURI, has announced the appointment of James W. MINTER as District Sales Manager of its new BIRMINGHAM, ALABAMA, office.

Mr. Minter has been connected with the Green Company since 1941. During that time, he has served in various phases of its operation . . . primarily sales. Prior to his present appointment, he was in charge of sales at the company's Chattanooga office.

Worthington—Atlanta, Birmingham, Charlotte

WORTHINGTON PUMP AND MACHIN-ERY CORPORATION, Harrison, N. J., has elected C. K. Hood, formerly manager of the corporation's New York District Sales Office, to a vice presidency. W. J. VAN VLECK, manager of the corporation's ATLANTA District Sales Office, will succeed Mr. Hood as manager of the New York District Sales Office.

C. W. KRAMER, resident general line salesman in BIRMINGHAM, ALA-, will succeed Mr. Van Vleck as manager of the Atlanta office.

I. W. LEGGETT, general line salesman at CHARLOTTE, N. C., has been appointed manager of the Charlotte Branch Office.

Mr. Van Vleck, a graduate of Pratt Institute, Brooklyn, joined Worthington in 1924 as a student sales engineer, and was then sent to Philadelphia as a general line salesman until 1938 when he was appointed assistant manager of that office. He was made manager at Atlanta in June 1944.

Mr. Kramer joined Worthington in 1929 upon his graduation from Stevens Institute of Technology. After completing his student engineering course he was located successively in Buffalo Works an an estimator, and El Paso and Atlanta as a general line salesman.

Mr. Leggett was graduated from North Carolina State College and started with Worthington in 1930 as a student. He was then assigned to the Atlanta Office as a general line salesman, where he has served since 1931 exeept for a three-year period of special duty at the company's headquarters at Harrison, N. J.



Popular Powerhouse is only one of a complete line of B-H Black Rockwool insulating materials—block, blanket, cements, etc. Let a Baldwin-Hill representative recommend the types and methods of application best suited to your equipment...show you how to reduce heat loss on the job—THERM-ENOMICALLY.*

IF IT'S TOO HOT

IT NEEDS INSULATION

Black Rockwool

Baldwin-Hill

@ azza

CIP this coupen and attach to your signed letterhead

☐ Mono-Block—for temperatures to 1700°F

*Economics of Engineered Heat Control

- ☐ Blankets—metal reinforced, large-area coverage to 1200°F
- ☐ No. 1 Cement—plastic insulation, to 1800°F
- Powerhouse Cement-high-adhesion finishing to 1700°F

BALDWIN-HILL CO., 607 BREUNIG AVE., TRENTON, N. J.

news for the South and Southwest (continued)

Chiksan Company-Houston

H. J. Hagn has been elected President and Director of CHIKSAN COMPANY. W. EDGAR SPEAR has been advanced to Chairman of the Board, and



J. H. Robinson now Vice President of Chiksan Company and General Manager of Well Equipment Mig. Corp., Houston Texas

J. H. ROBINSON has been elected a Vice President of Chiksan Company and appointed General Manager of WELL EQUIPMENT MFG. CORP., a division of Chiksan. Mr. Robinson became associated with Well Equipment Mfg. Corp. as a salesman in 1940, and assumed administrative duties in 1942. In 1946 he became Secretary and Treasurer. As General Manager he will continue to maintain his headquarters at 2023 Semmes St., in Houston. Mr. Robinson is a member and past Director of the Houston Chapter of NACA.

Hyster Co.—Birmingham

BRUNGART-JENNINGS, INC., 1306 First Ave., BIRMINGHAM, ALABAMA, has been appointed exclusive dealer for the "Hyster" line of lift trucks, mobile cranes, Turret Trucks and Straddle Trucks, according to recent announcement by the Hyster Com-PANY, 2902 N.E. Clackamas, Portland, Oregon.

Brungart-Jennings will handle sales and service in all counties of Alabama with the exception of Chambers County. Also included in the territory are counties in northwest Florida. Heading up the new dealership are NEWTON BRUNGART and GEORGE JENNINGS.

Dollinger Corporation-S.E.

The appointment of two new District Representatives has been announced by the DOLLINGER CORPORATION, Rochester, N. Y., manufacturers of Staynew Filters.



Sabel E. Baum, Dixie Enineering Co., Birmingham, Alabama, now District Representative for the Dollinger Corporation.

SABEL E. BAUM, DIXIE ENGINEER-ING Co., BIRMINGHAM, ALA., has been appointed District Representative in ALABAMA, Western FLORIDA and Marion, Hamilton, Bradley and Polk Counties, TENNESSEE.

After graduating from Alabama Polytechnic Institute as a Mechanical Engineer, Mr. Baum was actively engaged for several years in the fields of design, aviation, and industrial engineering, followed by several years of sales engineering.



Roy A. Stipp of Greenville, S. C. appointed District Representative of the Dollinger Corporation for North Carolina, South Carolina, and Eastern Tennessee.

ROY A. STIPP of GREENVILLE, S. C., has been appointed District Representative for NORTH CAROLINA, SOUTH CAROLINA, and Eastern TENNESSEE.

Mr. Stipp was graduated from the University of Kentucky with a B.S. in Mechanical Engineering. He served as Sales and Engineering Representative of Buffalo Forge Company for nine years and later represented that company in Greenville, S. C. He was with Tennessee Eastman Company for two years. Mr. Stipp started his own business as Manufacturers' Representative in 1945.

EXTRA YEARS OF MORE DEPENDABLE POWER

... at less cost per pound of steam



TODD BURNERS

GAS OR OIL

COMBUSTION EQUIPMENT DIVISION
TODD SHIPYARDS CORPORATION

81-16 45th Avenue

Elmburst, Queens, N. Y.



Briefs

What Your Leading Equipment And Supply Manufacturers Are Doing

PHIL SPRAGUE, JR., has been appointed Executive Vice-President of THE HAYS CORPORATION, Michigan City, Indiana, manufacturer of combustion instruments and controls.

MARTIN E. GILWOOD is now Director of Research, THE PERMUTIT COM-PANY, New York, N. Y.

COMBUSTION ENGINEERING - SUPER-HEATER, INC., New York, has announced the election of WILLIAM J. VOGEL and ROBERT M. HATFIELD as vice presidents.

OTTO G. SCHWENK of Darien, Conn., has been named vice president in charge of industrial products for the BLAW-KNOX COMPANY.

FORREST NAGLER, manager and chief engineer of ALLIS-CHALMERS atomic power section, has retired.

WILLIAM R. McNALLY has been appointed LINK-BELT COMPANY representative for the pulp and paper industry, with headquarters at the Pershing Road Plant, Chicago.

JOHN N. WELSH, associate director of HALL LABORATORIES INC., Pittsburgh, now will handle all service contracts and other business activities of this firm.

STANLEY D. MARGERUM has joined the R. M. HOLLINGSHEAD CORPORATION as Manager of Special Products for the Industrial-Aviation Division.

CHRIS H. BARTLETT has been appointed manager of the Transformer Division of the WESTINGHOUSE ELECTRIC CORPORATION.

H. C. Mears has been appointed Assistant Sales Manager of the Industrial Insulation Department of The Philip Carey Mfg. Company, Cincinnati.

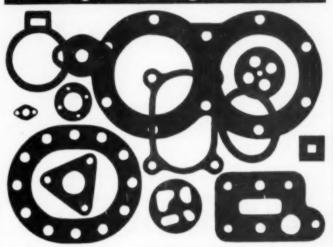
R. W. PFLUG has been appointed Coordinator of Inquiries for the Industrial Sales Division of the Detrex Corporation, Detroit.

J. M. Johnson has been named as Sales Manager, Transporter, of the AUTOMATIC TRANSPORTATION COM-PANY.

ZAY B. CURTIS, JR., is now Assistant to the President of C. H. WHEELER MFG. Co. JOHN M. SPERRY is Sales Manager.

Gaske by BELMONT

Made Right to Seal Tight . . . LONGER



There's a Belmont Gasket-molded, formed, extruded, or die or lathe cutfor every gasketing service. They're made for better joint and surface seals...
under any combination of service conditions... from a wide range of materials including Compressed Asbestos, Woven Asbestos Metallic, Red Rubber,
Cloth Inserts, Black Rubber, Vegetable Fibre, Cork-Vegetable, Gray Rubber,
Neoprene, Buna-N, Teflon, Silicone and many other compounded materials.

Because Belmont Gaskets are accurately and uniformly cut from just the right material to suit your particular service, they can usually be expected to deliver a valuable saving in maintenance costs and uninterrupted service by providing longer, more dependable service life.

Write or call your Belmont Distributor for recommendations . . . and get reference Catalog No. 40.



news for the South and Southwest (continued)

Hammel-Dahl Appoints Cowles & Co., Dallas

THE HAMMEL-DAHL COMPANY of Providence, R. I., manufacturers of Automatic Control Equipment, announces the appointment of Cowles & Company of Dallas, Texas, as their sales and service representatives in the Central Texas Area.

CLIFFORD A. COWLES, after graduating from the Georgia Institute of Technology, with a degree in Mechanical Engineering, became Chief Engineer of the Atlantic Steel Company. In 1923, he organized Cowles & Company and for the past 29 years this concern has been engaged in design and installation of boilers and industrial furnăces, as well as other types of mechanical equipment.

Associated with Cowles & Company, as sales and service engineers, are CRAIG MILLIS and DALE CUNNINGHAM, both graduates of Southern Methodist University with degrees in Mechanical Engineering.

The addition of Hammel-Dahl Automatic Control Equipment will enable Cowles & Company to offer a complete service on control valves, which are so essential in modern control applications in chemical and petroleum processing.

Republic Rubber Div.—Texas

THE SAN ANTONIO PIPE & SUPPLY Co., 1735 So. Alamo, SAN ANTONIO, TEXAS, has been appointed an Accredited Distributor of REPUBLIC RUBBER DIVISION, LEE RUBBER & TIRE CORPO-RATION.

Texas Eastern Appoints Hemphill President

"HERBERT A. HEMPHILL, widely known geologist in West Texas and veteran of twenty-two years' experience there, has been appointed president of Texas Eastern Production Corporation, wholly owned subsidiary of Texas Eastern Transmission Corporation.

Mr. Hemphill has resigned from Magnolia Petroleum Company at Midland to accept this new post. A native of Hattiesburg, Mississippi, he majored in geology at the University of Texas.

Kerotest Appoints Dodds-SE

D. G. Dodds, Jr., has been appointed district sales representative for Kerotest Manufacturing Company, 2525 Liberty Ave., Pittsburgh Pennsylvania in the Southeastern territory with headquarters at 3727 Peachtree Road, N.W., Atlanta, Georgia.



D. G. Dodds, Ir., Kerotest Manufacturing Company's Southeastern District Sales Representative with headquarters in Atlanta, Georgia.

Mr. Dodds is a graduate of Washington and Jefferson College and has been connected with the Kerotest general sales department in Pittsburgh and the New York district sales office for the past several years.

Southern States Equipment Completes New Substation

SOUTHERN STATES EQUIPMENT COR-PORATION recently announced completion of a new substation located adjacent to the home office and factory in HAMPTON, GEORGIA. The new station will not only supply normal power requirements but will be easily adapted for testing power fuses, distribution cutouts, fuse links and disconnecting switches.

Three power transformers normally supplying factory requirements can be connected in parallel to supply current to specially designed transformers capable of delivering currents of a high order for short circuit tests. Switching arrangements are provided for selecting values of currents over a wide range for short circuit tests.

The station also provides a facility for testing distribution cutouts at rated voltage and at currents varied by switching transformers into and out of service.

Southern States Equipment Company manufactures high voltage electrical equipment, mechanical devices and textile machine parts. The company's 25,000 sq ft plant addition was announced in the April issue of SP&I.

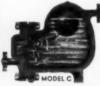
Nicholson W. O. Traps Are

LEAKPROOF IN SUPER HEAT

Nicholson weight-operated traps will not leak live steam, even though body may become completely dry due to re-evaporation. Unlike most bucket and float traps, Nicholson units do not depend on buoyancy of float to raise valve. Their extremely large orifices also keep valve clean, preventing blow-through. Working parts of stainless steel.

3 TYPES, for every heavy-duty use; pressures to 1500 lbs. Also for air and gasoline.





Catalog 751 or see Sweet's 175 Oregon St. Wilkes-Barre, Pa.

W.H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

Coen Company Appoints May in Atlanta; Hudgins—Charlotte

COEN COMPANY, manufacturers of mechanical, steam and air oil burners and gas burners, oil heaters, oil strainers, fuel oil pumping sets and allied equipment, through its subsidiary, COEN BURNER SALES COMPANY. Union City, N. J., announces the appointment as exclusive representa-



Robert S. Hudgins now Charlotte area representative for Coen Company

tives in the Atlantic and Charlotte areas the following manufacturers' representatives:

MR. ROBERT S. HUDGINS, P. O. Box 6091, CHARLOTTE, N. C., who has been established for several years in this territory representing a number of industrial and power equipment accounts. Mr. Hudgins graduated from Virginia Polytechnic Institute in mechanical engineering in 1934, worked with Ingersoll-Rand as Sales Representative until 1941, then with Kennametal from 1941 to 1947. In 1947, he became a partner in a Charlotte sales engineering organization which he left in 1949 to start his own business selling equipment, particularly that used in connection with boiler and controls in power and industrial applications.

MR. STEVEN C. MAY, 585 Sherwood Road, N. E., ATLANTA, GA., recently set up his manufacturers' representative business in Atlanta to serve a number of industrial and power equipment accounts. Through past activities he is well established in the area and comes back as a former resident.

Mr. May graduated from Georgia Institute of Technology in 1925, served as Southeastern District Manager, then as National Accounts Manager for Iron Fireman Manufacturing Company until 1939. He then became Vice President and General Sales Manager of Darling Valve & Manufacturing Company until 1946, after which he served in consulting engineering until 1949 when he became Sales Manager of Blackmer Pump Company, from which he has just resigned to open his sales office in Atlanta.

Harbison-Walker-Alabama

An additional manufacturing unit is nearing completion at the FAIR-FIELD, ALABAMA plant of HARBISON- WALKER REFRACTORIES COMPANY, according to the engineer-constructor, THE RUST ENGINEERING COMPANY.

The new unit will increase Fairfield production of silica brick by an estimated 50%.

Existing raw materials handling facilities will service the added unit which is equipped to handle complete manufacture of the refractories used basically in building open-hearth steel furnaces, by-product coke ovens, and miscellaneous furnaces in the iron and steel industry and other industries.



3/5 Usual Size, 1/2 Usual Wt.
—Lower Mament of Inertial



Sier-Beth Geer Coupling compared with two major conventional types of same shaft size, HP



Assembled, Decoupled in seconds!
Only 7 parts. No bolts, no nots, no flanges—no special tools required.

Which of These MAJOR ADVANTAGES Can You Put to Work?

- Allow more compact designs
- Cut assembly costs
- Slash down-time
- Reduce wear on equipment
- Eliminate corrosion problems
- Are safer, more dependable, more durable

FIND OUT HOW you can capitalize on these revolutionary advantages! Talk it over with your local Sier-Bath Distributor or Representative (see list below). He can tell you the whole story—supply Standard Sier-Bath Couplings from stock to accommodate $\frac{3}{6}$ " to $6\frac{3}{9}$ " shafts, 4 to 550 HP per 100 RPM. Floating Shaft, Mill Motor and Vertical Types are available from factory stocks—special types and sizes on request.

For Complete Information and Service, Call or Write:

Atlanta—Industrial Service Inc.
Atlanta—Ira M. Valentine
Beten Reuge—Louisiana Bearings Co.
Birmingham—Owen-Richards Co., Inc.
Charlotte—M. R. Snyder Co.
Chattaneege—Electric Motor Sales
& Supply Co.

Houston-South Western Gear Works

Kensus City, Mo.—Associated Bearings Co. Memphis—Hays Supply Co. Nashville—Tennessee Machinery Co. Richmond—Russell R. MacDonald Co. Savennah—Georgia Supply Co. Tampa—Tampa Arnature Works Thomasville, Go.—E. J. Williamson

Sier - Bath GEAR & PUMP Co., Inc. 9263 Hudson Blvd., North Bergen, N. J.
Also Manufacturers of Procluina George, and Screw and "Georges." Batary Pomas

news for the South and Southwest (continued)



New TCI Office Building Completed

The new six-million dollar office building for the Tennessee Coal, Iron and Railroad Co. in U. S. Steel's Birmingham, Alabama subsidiary, is now completed and occupied. Built by the Daniel Construction Company of Birmingham, Alabama, and Greenville, South Carolina, it is one of the country's most modern office buildings.

Designed to house TCI's complete office staff, the unit brings them together for the first time from several downtown Birmingham office buildings. This 5-story structure boasts a total of 16 reversible escalators and the direction of these is changed during the day to coincide with the natural flow of traffic to and from the building and contributes greatly to the efficiency of the building's operation. Housed on top of Flint Ridge, the new office building overlooks the major steel plants and provides a dramatic view of industrial Birmingham.



Don't let construction dust mar final painting and cause extra repainting.

Subox and Subalox paints and "Plan Painting" insure utmost protection and reduce painting and repainting to thriftiest minimum.

In special metal scarcities, Subox paints add to life of standard metals when "plan-applied" during construction.

Used as primers, finish coats or both, Subox paints apply over new, rusty or old surfaces including galvanizing.

Suboxide of lead, the basic pigment, gives Subox paints superior protective quality. Time-tested for over 25 years.

Write for free copy of article on "Plan Painting".

Cubox Inc.

6 FAIRMOUNT PLANT HACKENSACK N J

N.A.C.E.—Galveston, Texas

The National Association of Corrosion Engineers closed its 8th annual conference and exhibition in Galveston, Tex., by elevating to the post of president Mars G. Fontana, of Ohio State University, electing Walter F. Rogers, Gulf Oil Corporation, Houston, to the vice-presidency, and returning R. A. Brannon, Humble Pipe Line Company, as treasurer. A. B. CAMPBELL, executive secretary, was also re-elected.

The highlights of the conference with two round table sessions, held on the last day of the conference, one taking up problems and their practical solutions as affecting pipeline and underground corrosion, the other dealing with general corrosion.

One session was concerned with corrosive effects of sulfur, fluorine and mercury, with suggestions being offered toward the protection of chemical plant equipment exposed to the vapors of these elements.

Refinery problems of corrosion were assigned an entire session, J. K. Rice, Cyrus Wm. Rice & Co., Inc., Pittsburgh, presented a paper "Treatment of Recirculated Cooling Water," which was of interest not only to the refinery men attending, but also to the engineers from the various gas trunkline companies and gasoline plants.

Metallizing economics in modern industry formed the subject of an exhaustive paper by A. P. Shepard and R. J. McWaters, Metallizing Engineering Company, in which the possibilities and limitations of metallizing as a corrosion mitigation measure were outlined for numbers of specific industrial set-ups. An abstract of this paper will be featured in an early issue of SP&I.

A film, "Corrosion in Action," was shown at a general session, under the sponsorship of International Nickel Co., Inc., and covered in a non-technical manner through clever animation the effect of corrosion through the various means whereby its attack is sustained by different types of industrial structures.

Total attendance at the Conference, exclusive of last minute registration for the two round table sessions, was reported as 1,377, and the exhibition, held in connection with the conference, included more than 100 booths at which various types of corrosion control and anti-corrosive metals and protective coatings were displayed.

The 1953 annual conference of the N.A.C.E. will be held in the Palmer House, Cleveland, the last week of March.

Hyster—Dallas, Atlanta

THE HYSTER COMPANY, 2902 N. E. Clackamas St., Portland 8, Oregon, has announced the promotion of Robert Hill to district manager of the Southwest territory. Mr. Hill will make his headquarters in Dallas, Texas and work with Machinery & Supplies Co., Inc., Hyster Company of Louisiana, King and East Machinery Corp., and C. H. Collier Company.

JACK CAIRNS has been appointed as new district manager for Hyster in the territory including portions of Florida, Alabama, North Carolina, and Georgia. Mr. Cairns, whose headquarters will be in Atlanta, Georgia, will work with Aichel Steel & Equipment Co., Freeman & Sons, Inc., Wrenn Brothers, and Brungart-Jennings, Inc., Hyster dealers in that area.

Huge Expansion Joint at HL&P—Houston, Texas

U NITED States Rubber Company recently installed this huge rubber and fabric expansion joint between steam turbine and condensor in Green's Bayou Station of the Houston Lighting and Power Co., Houston, Texas.

The expansion joint is 8 feet high, 21 feet wide and 1 foot face to face. It compensates for different rates of expansion and contraction between turbine and condensor, isolates vibration, and supplies a tight durable seal which is essential in the vacuum system.





Both seats are non-corrosive bronze for top protection against pitting and corrosion. Nuts and both ends are high test, air refined malleable iron — practically indestructible in use or abuse.

Remember, the extra work life of a Dart is money in your pocket! Darts can be installed and reinstalled, time after time, with absolute assurance of tightness.

DART UNION COMPANY Providence 5, Rhode Island

The Fairbanks Co. — Distributors

Boston New York Pittsburgh



news for the South and Southwest (continued)

Chemstrand-Decatur, Ala.

Three appointments to the research and development center of THE CHEM-STRAND CORPORATION, DECATUR, ALA-BAMA, were announced recently by DR. FRANK J. SODAY, director, to supplement a group of technicians who have served as the nucleus in this phase of the company's Acrilan project.

The new appointees are S. JACK DAVIS, formerly associated with Callaway Mills; FRANK B. LUTZ, recently with Millville Manufacturing Company, and CHARLES H. APPERSON. previously employed by Tennessee Coal & Iron Company.

They will be associated in research activities with JOSEPH T. CHESTNUTT, WILLIAM S. MOORE, CLOYCE L. PUR-DOM and CARLTON D. WHITT who are engaged in the company's research and development activities at Decatur.

In addition to the four-building research and development center being built at Decatur, Chemstrand also is erecting at this site its administrative headquarters building and its multiunit manufacturing facilities for the

production of Acrilan acrylic textile fibers. And at PENSACOLA, FLORIDA, a plant is under construction for the manufacture of Chemstrand nylon filament varn

Corning Glass Works-W. Va.

A major expansion program adding approximately 75,000 sq ft of floor space has been completed at the Conn-ING GLASS WORKS plant at Parkersburg, W. Va., by THE H. K. FER-GUSON COMPANY, industrial engineers and builders.

The project consisted of a one-story and basement section which will house additional facilities for manufacturing Pyrex piping and laboratory glassware. The main floor is of structural steel construction, with a precast concrete roof, steel sash and concrete block walls and a concrete floor. The basement is of reinforced concrete construction. Existing shipping platforms and railroad sidings were extended, new concrete driveways were provided, and an oxygen station was relocated.

Drew-Mo., Tenn., Okla.

E. F. DREW & Co., INC., 15 East 26th St., New York 10, N. Y., has made a number of changes in territorial assignments for District Engineers, as well as recent additions to the Drew Power Chemical organization.

B. S. FARLEY, formerly of St. Louis, has now been appointed as the new District Engineer in BALTIMORE. A. W. GORLINE is now attached to the St. Louis office as Service Manager. J. D. GIBSON is the new District Engineer in KNOXVILLE, and RALPH D. BARTOW is the District Engineer in TULSA area.

These men will be responsible for sales and service of water treatment and other products and services of the Power Chemicals Division.

W.B.M.A. Elects Sowell

JOSEPH A. SOWELL of the T. R. MILLER MILL CO., BREWTON, ALABAMA. a participant in the wirebound shipping container industry for 27 years, was elected president of the WIRE-BOUND BOX MANUFACTURERS ASSOCIA-TION at its annual meeting in San Francisco.

Mr. Sowell joined the T. R. Miller Mill Co. in 1925 and became identified with the W.B.M.A. the same year He has been an active participant in the association's programs since then and has served on many important committees

G-E Equipment for Lehigh Portland Cement-Florida

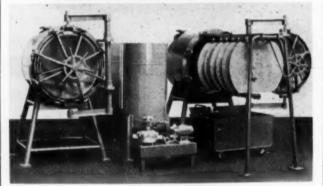
THE GENERAL ELECTRIC COMPANY is supplying approximately \$800,000 worth of electric equipment for the LEHIGH PORTLAND CEMENT COM-PANY'S new two-kiln plant near JACK-SONVILLE, FLA., scheduled to go into operation this summer.

Designed to meet a critical shortage of cement throughout the Southeast, the new plant will be capable of producing nearly 1% million barrels of cement annually.

Among the major electric items will be seven G-E 700 hp synchronous motors which will drive the raw grinding and clinker pulverizing mills. Other G-E equipment involved will include over 150 general-purpose motors.

Major raw material for the plant will be coquina shells dredged from rich deposits found in the Florida soil. These shells have a high content of calcium carbonate, a primary ingredient in the manufacture of

SAVE MONEY by clarifying condensed returns of all EMULSIFIED or free oils with BLACKBURN-SMITH REFINER



Outstanding Advantages

 Breaks tightest all emulsion in water
 Saves hout units and fresh water 3. Reduces boiler maintenance costs 4. Simple, inexpensive operation

The REFINER represents an outstanding achievement in pressure leaf filters, designed for extremely fine filtration and for the removal of both emulsified or free oil from condensate down to less than 1 ppm.

Existing installations prove beyond a doubt the effectiveness of the Refiner, which enables operators to re-use condensate formerly discarded because of the oil content. Representatives wanted.

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BLACKBURN-SMITH MFG. CO., INC. 99 River Street, Hoboken, N. J.

Subsidiary of Condenser Service & Engr. Co., Inc.

Phone: Rector 2-9340

SSIRCO Gets Navy Contract

An eight million dollar contract for prefabricated buildings has been awarded to Southern States Iron Roofing Company, Savannah, Georgia, by the United States Navy, acting as building procurement agency for the armed forces. The buildings will be used by the Army as multipurpose buildings.

The contract calls for 4,000 complete rigid steel frame buildings ready for erection. The buildings will be fully insulated with glass fiber insulation and will include windows, doors, and all other components for a complete building. Designed particularly for fast erection by troops, the Southern States building is said to be erected in seven or eight hours by a six-man crew. It is light in weight and easy to package for overseas shipment.

The company has established a new 60,000 sq ft fabricating plant in MEMPHIS, TENNESSEE to manufacture the buildings.



Here are the components of a "Kit of Tools" for the G-E Productive Maintenance Program. The file-size package of aids is designed to help maintenance engineers in setting up a complete productive maintenance program to get more productivity from existing facilities.

G. E. Productive Maintenance Program

General Electric Company's "Productive Maintenance Program" will assist maintenance engineers in setting-up a program to minimize lost production time and forced idleness due to equipment failures. In addition, it provides better spare parts control, smoother production flow, and enables industry to gain optimum output from existing equipment.

Productive Maintenance, as outlined in G-E's plan, recommends (1) an adequate staff of trained maintenance men, armed with (2) the tools needed to perform properly the functions of (3) regular, routine checks of operating equipment, and (4) planned outage of this equipment at regular, scheduled intervals. Rebuilding and modernizing machines during

time of planned outage is done readily with (5) an adequate stock of mechanical and electrical renewal parts.

To help the maintenance engineer materially, the company offers a Productive Maintenance Kit, a life-size package of maintenance aids to guide him in setting up a working program. The kit contains an instruction bullettin, a typical balance sheet for keeping historical data on each machine, planned outage forms, and checklists for motors, control, and other equipment.

To supplement the kit, a new slidefilm, "Productive Maintenance," is available for showing through the local G-E offices. The film explains how Productive Maintenance can benefit every industrial plant.

JEFFERSON

300 LB. Trouble Free Unions for Tough Jobs

JEFFERSON Unions are made of Air Furnace Malleable Iron of an average sensile strength of 55,000 p.s.i., with a yield point of 36,000 pounds and an elongation of 15% in two inches.

Our seat rings are cut from seamless drawn brass tubing, free from all casting defects—sound and uniform always.

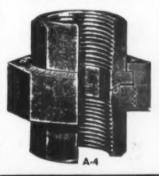
They are accurately tapped at all times; are carefully air tested and inspected before shipment, and each and every one approved only if they meet our rigid standards of imspection.

> Slightly Higher Priced But more than worth it."

See these outstanding features-

- * A ground ball joint to give leakproof service
- Octagonal with square corners fits any type of wrench
- or No gasket required, hence no maintenance problem
- ➡ Hot-dip galvanized to Government Standard for corrosion resistance

Made in all thread since from 16" to 4" American Standard Taper Threads. Also manufacture Excel 250 lbs and Master 150 lbs. All unions can be turnished with



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COMMSTONE HOLDERS



Hold Commstones rigid and true for concentric resurfacing of commutators and slip rings while running at normal speeds in their own bearings. Interchangeable boxes 1", 2" and 3" wide handle grinding jobs up to 41/4" wide.



MARTINDALE COMMSTONES AND



MICA UNDERCUTTERS FOR SLOTTING COMMUTATORS



Nine Motor Driven Types
MARTINDALE PROTECTIVE MASKS



Weigh less than 1/2 ounce

Write for 64-page Catalog describing these and many other products for Industrial Maintenance, Safety and Production.

MARTINDALE ELECTRIC CO.
1334 Hird Ave. Cleveland 7, Ohio

news for the South and Southwest (continued)



Davison Chemical Corporation's Lake Charles, La., Plant

An airplane view, drawn from construction plans, of the \$7,000,000 plant which The Davison Chemical Corporation is building for production of petroleum cracking catalyst and other manufacturing operations 10 miles south of Lake Charles, La., on the Calcasieu River. Fenced area is 18 acres, total property area 112 acres. At the entrance to the plant, left is the administration building and laboratories, right the change house and parking lot for employees. Power equipment, boilers and sub-station are at upper left and immediately below them the garage, storage area and shops. Center is the main process building with spray dryers for catalyst production and above and to the right other production facilities and storage tanks. Water-treating equipment and reservoir are lower right. Day & Zimmerman of Philadelphia are architect engineers and Consolidated Engineering Company of Baltimore are general contractors.

Safety in Plant Maintenance

These illustrations on the important matter of manually lifting a heavy object are used in the plant wide safety program of Westinghouse Electric Corporation. Photo at the left demonstrates the proper lifting posture while method illustrated at the right so often causes injuries. Remember—Bend the knees, placing the strain on the leg muscles instead of on the back.

Keep the load close to the body and lift in a smooth, gradual motion instead of an uneven, jerky movement. If necessary, use a hoist. Whether using a hoist or not, clear vision over the load should be maintained at all times. It does not take any additional time to lift safely.

Proper Lifting Posture

Incorrect Lifting Posture





PROFIT by the EXPERIENCE of America's FINEST PLANTS

They REPEAT-ORDER
HOFFMAN Heavy-Duty
VACUUM CLEANING EQUIPMENT
for Wider Range Dust Removall

One installation sells another, as plant after plant finds that Hoffman vacuum cleaning units save labor—salvage material—reduce product defects—eliminate dust hazards. They've proved that they can clean larger areas of walls, floors and overhead surface with Hoffman equipment. Built to provide bigger capacity, higher vacuum and long years of service on the most grueling plant cleaning jobs.



YOUR CHOICE OF 4 BIG-CAPACITY PORTABLES

Advanced design and construction features for fast, efficient cleaning, with one-man handling, 1½, 3, 5, and 7½ H.P. models to match your specific cleaning requirements

STATIONARY SYSTEMS IN A WIDE RANGE OF SIZES TO FIT YOUR MAINTENANCE OR PRODUCTION OPERATIONS

Provides cleaning in several areas at the same time. Sweepers attach cleaning hose to conveniently located inlets (in a permanently piped system). Dust is removed pneumatically to central collectors for easy disposal.

MULTISTAGE CENTRIFUGAL BLOWERS AND EXHAUSTERS

For agitation of liquids, combustion, mixing-for all air requirements (including the elimination of compressed air). No internal moving parts. Low power consumption. Adopted as standard in steel plants, textile and ice plants requiring 24-bour continuous service. Wide range of pressures, capacities and vacuum, for air or gss. Tell us your requirements.







FRESH AIR
REDUCES FATIGUE
GIVE 'EM AIR —
FRESH AIR!
WATCH PRODUCTION CLIMB!

Model TRoof Ventilator, Hood Opens Locked in Any Desired Position With or Without Dampers Propeller Pitch Adjustable

Industrial Air Model T Roof Ventilator can be used as a supply fan or to discharge contaminated air. Rugged construction. Sizes for all specifications from 18" through 72" in diameter, belt or direct driven operation. Duct Fans
Direct or
Belt Driven
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Cooler
Root
Ventilators
Duct Type
Fan
Duo Duct
Tubeaxial

WANTED

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Ever since you were knee-high to a hop-toad, you've heard about America's wonderful natural resources—the bountiful fertile fields, the towering timber growth, the boundless water power, and the untold wealth of gold, iron, oil, silver, coal and other natural treasures that lie buried in the ground.

Is it because America has *more* natural resources than any other country that Americans enjoy the world's highest standard of living? No—many countries have as much—some have more.

Then is it because Americans do more with what they've got?

Yes! And the reason is as plain as the nose on your face. It's because Americans are free to develop their natural resources—and their natural resourcefulness—in the wholesome climate of open and strenuous COMPETITION.

COMPETITION—not "regimentation"—is what eggs a man on to do his best.

COMPETITION—not government control—is what urges a business to give its customers ever greater value for their money.

So let's say "NO SALE" to the *ism* peddlers who would have us swap our U, S. A. system of free competition for their "planned" regimentation—trade our U. S. A. freedom and plenty for their serfdom and poverty!

* * *

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Ceco Steel-Oklahoma

CLIFFORD N. BARBER, formerly production manager for W & W Steel Company, has been appointed manager of CECO STEEL PRODUCTS CORPORATION'S reopened OKLAHOMA CITY district office, 1225 Linwood Boulevard, Oklahoma City 6, Oklahoma.

Mr. Barber started in the steel business in 1924 with United Iron Works, Iola, Kansas, and later was a salesman for Ben Sibbitt Iron and Foundry and George C. Christopher & Son, both in Wichita, Kansas, and Hackney Iron and Steel, Enid, Oklahoma.

He was on the sales force of Robberson Steel company in Oklahoma City from 1937 until 1946, when he went to W & W Steel Company as production manager.

Chrysler Corp. Expands-La.

Production capacity of CHRYSLER CORPORATION'S Michond Ordnance Plant, New ORLEANS, will be more than doubled. Authority to proceed with expansion of facilities to increase ultimate production rate of tank engines by 125 per cent over the original schedule was granted Chrysler by the Birmingham Ordnance District. The expansion will require use of the entire manufacturing area at Michoud and an enlargement of the test cell building now under construction.

Quaker Rubber-St. Louis

QUAKER RUBBER CORPORATION, Division of H. K. PORTER COMPANY, INC., Philadelphia, has established a stock-carrying branch warehouse and sales office at 4006 Papin Street, St. Louis, Mo. The new branch will operate under the supervision of J. H. JOYNER, District Sales Manager.

Industrial Engine Division Ford Motor Company—S. E.

RAYMOND L. SUTTON has been appointed to head a new sales and service office for the Tractor and Industrial Engine Division of FORD MOTOR COMPANY in Southeastern states.

Mr. Sutton, a sales and service engineer, will have headquarters at Atlanta, Ga., and offices at Charlotte, N. C., Memphis, Tenn., New Orleans, La., and Jacksonville, Fla.

Radiator Specialty Company W. Va. & Mo. Representatives

RADIATOR SPECIALTY COMPANY, CHARLOTTE, N. C., has announced the appointment of five new representatives for the Solder Seal line of industrial specialties.

Additions to the field force include WILLIAM C. PRUETT, JR., CHARLESTON, W. VA. District; and RALPH L. WINTER, ST. LOUIS District.

Columbia-Southern Chemical Corpus Christi Expansion

COLUMBIA-SOUTHERN CHEMICAL CORPORATION soon will be in full-scale commercial production of two new products, Hydrotan and Hydrocarb, within three months at its CORPUS CHRISTI, TEXAS plant.

Facilities for the production of Hydrotan and Hydrocarb are part of Columbia-Southern Chemical Corporation's \$8,000,000 expansion program at Corpus Christi. The firm, a whollyowned subsidiary of Pittsburgh Plate Glass Company, is doubling chlorine producing facilities and the office and laboratory building will be enlarged in the near future.

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CAN HELP SOLVE YOUR GAS CONTROL PROBLEM

The Complete Line Includes

- Check Valves
 - Pressure Controllers
 - Inspirators
 - District Regulators
 - Station Regulators
 - Relief Valves
 - Filters
 - "U" Gages

For over 70 years Norwalk Engineers have been helping Gas Users with their Gas Distribution and Control Problems. For Dependability, Convenience, and Economy, in the field or in the shop. Send Norwalk Your Gas Problem.

NORWALK VALVE COMPANY

SOUTH NORWALK

CONNECTICUT

FYR-FEEDER

EC II S BAT OFF

INCOMPARABLE ALL SOLID FUELS STOKER
BURNS COAL AND/OR WOOD WASTES



DON'T WORRY about the HIGH COST of COAL YOU CAN DO SOMETHING ABOUT IT!

REMOVE YOUR PRESENT STOKER and "RENT" an industrial FYR-FEEDER for ONLY its SAVINGS until paid for

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TUBE BOILERS

COIL AND SPECIALTY BENDING

IDEAL FLUE TOOLS

STEEL AND COPPER FERRULES

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PITTSBURGH

CHICAGO

TUBE CO. OF AMERICA

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FRED S. RENAULD & CO.,

Tools — Supplies for on-the-job Plant Maintenance

(Starts on page 8)

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Wet-Dry Vacuum Cleaner

F-30 CLARKE SANDING MACHINE
COMPANY, Muskegon, Mich.,
is offering a fast, thorough,
quiet, new wet-dry vacuum cleaner
for industrial cleaning.

A three stage turbine, powered by a 1 hp Universal type motor, both moisture proof and rubber mounted, picks up water, dirt and dust. The water lift is 63 in. Portability is obtained with four free-running, ball-bearing swivel rubber casters.

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The unit is furnished complete with hose, wand, water pick-up tool and pick-up tool for carpets. Tools for all special cleaning needs are available.



Portable, heavy duty, wet-dry vacuum cleaner of Clarke Sanding Machine Company.











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Chelsen Type IND is a heavy duty fan recommended far general in-dustrial service. Flexible and efficient, it is capable of moving la valumes of air.

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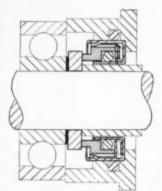


new equipment (continued)—starts page 8

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Mechanical Shaft Seal

F-31 CARTRISEAL CORPORATION, 1449 W. Randolph St., Chicago 7, Illinois, has developed a newly designed, positive mechanical shaft seal that is said to contain many improvements to meet the need for higher pressures, higher temperatures and higher rpm.



Cartriseal Corporation's new mechan-

In the construction of the new seal, materials are selected and tested to withstand exposure to practically all liquids and gases without deterioration. It is claimed that the new seal can be varied to meet almost any operating condition or assembly problem, adapts itself readily to a host of applications, and effects substantial savings. It occupies less space with structural fitness. It has hydraulic balance and low unit load pressures to insure longer life. It is applicable for such uses as on washing machines; water, oil, and fuel pumps; hydraulic transmissions, generators, gas blowers, and othe requipment requiring a positive mechanical seal.

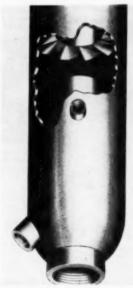
Line Type Purifier

F-32 THE V. D. ANDERSON
COMPANY, 1935 West 96th
St., Cleveland 2, Ohio, has
announced a new low-cost line type

purifier, Type LC Hi-eF, for smaller pipelines from ½ in. to 2 in.

Applications are to clean up steam processing lines to get better production out of kettles, sterilizers, laundry equipment, vulcanizing machines, etc.; to protect small engines, turbines, and regulating equipment from pipe scale and other solids; to remove entrainment from vapor lines following evaporation or distillation; to purify steam for food processing lines, and many other steam and air applications.

This new purifier removes entrainment by means of an improved centrifugal element within the unit which engages and imparts a rapid rotational motion to entrainment laden vapor, throwing the solids and water outward to the walls of the purifier. Each unit is warranted to remove more than 99 per cent of the entrainment. Type LC Hi-eF Purifier is installed like a valve or steam trap and is very compact.

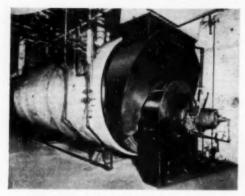


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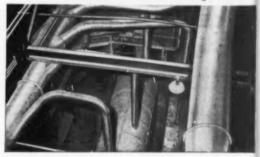
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Catalogs and Bulletins

of interest and help to the plant maintenance man

(Helpful catalogs and bulletins start on page 16)

B-10 NEALS FOR BEARINGS—Klozure Catalog 10, 100 pages—Illustrates at types of Klozures (oil and grease seals for bearings), describes typical applications and lists sizes and parts numbers. Describes in detail mechanical pressure seals for rotary shafts.—GARLOCK PACKING COMPANY. Palmyrs, N. Y.

B-11 WHAT'S A SILICONE?—Catalog, 24 pages—Defines silicones. Discusses use of silicone lubricants for maintenance of meters exposed to weather, exposed pump in chemical plant, trolley bearings in core oven conveyor system, use where resistance to chemicals is essential, and other applications. Protective coatings are described, including silicone aluminum finish for powerhouse stacks, silicone-based subjects are electrical insulation, Silastic, defoumers, release agents, fluids, water repellents, and polishes.—DOW CORNING CORPORATION, Midland, Mich.

B-12 HYDRAULIC SETTING REFRACronits—Hydrochure, 12 pages—Presents five different products for casting special refractory shapes and three products for gunning and siap troweling applications —hydraulic setting refractories for services through 300 F. Suggests solutions for maintenance problems.—JOHNS-MANVILLE, 22 East 40th Bt., New York 16, N. Y.

B-13 ADHESIVES AND COATINGS—
Bulletin, 32 pages—3M Adhesives,
Coatings, Sealers, designed to cut coats, reduce maintenance, and increase operating
efficiency, are described, with tables liating
the control of the color, the control of the color, and the color of the color of the various products, add in the reduction
of maintenance.—MINNESOTA MINING &
MFG. CO., Adhesives & Coatings Division.
411 Piquette Avs., Detroit 2, Mich.

B-14 INDUSTRIAL FLOOR MACHINES
— Builetin \$3.4, 1 page — Tennant
Model R Floor Machine is illustrated and
described, including design features, operation, applications, and specifications,—G. H.
TENNANT COMPANY, 2530 N. 2nd St.,
Minneapolis 11, Minn.

B-15 BUILDING MAINTENANCE—Hand Book No. 7, 64 pages—Discusses versied problems in maintenance of buildings, grounds, and fixed property, and sug-

gests practical and economical solutions through use of the company's floor materials, seals and finishes; leak stopping and moisture-sealing materials, roofing, and other products. Applicational photographs of drawings. — FLEXROCK COMPANY, and Chubert Sia, West of 26th, Philadelpha, Sealenha, S

B-16
TUBING FAILURES — Booklet TR
516, 40 pages—Factors affecting tube
life in high-pressure, high-temperature applications are presented, including results of
investigations of failures of carbon steel,
intermediate chromium - molybdenum alloy
steel and stainless steel tubing in boilers,
cracking stills, heaters, and heat exchangers
during service at elevated temperatures and
pressures in the power, oil, and chemical
processing fields. THE BABCOCK & WILCOX CO., Tubular Products Division, Beaver
Fails, Pa.

B-17 ELECTRICAL AND LUBRICATING PRODUCTS—Series F.L.B. 398-C. 8 pages—Quick reference folder deacribes Trico ing powder-packed renewable, one-time and plus fuses, fuse pullers, "Kilplok" clamp for fuse clips, "Kilplok" clampler, and lubricating devices. Wall chart shows types and sizes of lubricating devices with suggestions for selection and application. II-lustrated.—TRICO FUSE MFG. CO., 2948 N. 5th St., Milwaukee 12, Wis.

B-18 PLANT MAINTENANCE JOBS-maintenance cleaning and related Jobs generally performed in factories and mills by application of the company's products stresses importance of careful selection of material and method of application—OAK-ITE PRODUCTS, 22 Thames St., New York 6, N. Y.

B-19 PIPE TOOLS—1952 Catalog and Data Book, 28 pages—Glyces pertinent information on pipe and bolt machines power units; ratchet threaders; reamers, catters, and other pipe tools in the hand

and power classification. Pen and ink drawings and technical copy tell how to locate and correct pipe tool troubles. "Operations Guide" clarifies 21 operations. — BEAVER PIPE TOOLS, INC., 325 Dana St. N. E., Warren, Ohio.

B-20 PACKINGS FOR THE POWER PLANT—Folder, 6 pages—Features a flow sheet of a rudimentary industrial power plant with each unit keyed to the proper packings and gaskets. Illustrated with photographs. Captions give construction information, sizes, and other pertinent data.—JOHNS-MANVILLE, 22 East 46th St., New York 16, N. Y.

B-21 PROTECTIVE COATINGS—Leaflet E-CGCC—Color chart shows samples of colors and finishes of "Coro-Gard" brand protective coatings for metals, especially recommended by the manufacturer for railway equipment, periodeum handling equipment, marine installations, chemical processing equipment, and severe industrial service.—MINNESOTA MINING & MFG. CO., Adhesives & Coatings Division, 411 Piquette Ave., Detroit 2, Mich.

B-22 PIPE TOOLS—1953 Catalog—Gives pertinent information on three pipe and bolt machines: power units, ratchet threaders; reamers, cutters and other pipe tools in the hand and power classifications. Contains Operating Guide. Illustrated.—BEAVER PIPE TOOLS, INC., Dana Ave., Warren, Ohio.

BALL EQUIPMENT MAINTENANCE—
Brochure, 4 pages—"How to Cut Costs on Equipment Maintenance" gives complete information on Elec-Detec, the new electronic setshoscope, for use by maintenance men in locating and diagnosing mechanical troubles that delay production. Instrument is designed to cut costs on equipment maintenance in diesel, heating, machinery, power, refrigeration, and other fields.—ANCO INSTRUMENT DIVISION, American Name Plate & Mig. Co., 4254 West Arthington St., Chicago 24, Ill.

B-24 PHENOLIC COATING RESIN—duces Phenoline 200, a modified thermosetting phenolic resin for protecting atructural and mechanical equipment against corresion; discusses physical properties, preparation of surfaces, application procedure and technique, and reports on laboratory corresion testa.—CARROLINE COMPANY, 7603 Forsyth Blvd., St. Louis 5, Mo.

B-25 FLOOR MAINTENANCE—Bulletin.

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B-26 PRECISION MANDREL—Bulletin, the "Collettmandrel," a simple mandrel that expands like a collet, grips and releases the inside of the work with the same maneuver a collet grips and releases the outside, and made to fit all machines designed for use of collets to hold work pieces during machining operations.—E. WESTIRERIG CORPORATION, 806 Beley Ave., Syracuse 11, N. Y. B-26 PRECISION MANDREL Bulletin

B-27 LIGHTING MAINTENANCE - Hul-B-27 Lighting Maintenance—Bul-letin, 12 pages—The Why, When and How of Modern Lighting Maintenance" stresses planned maintenance of both light surfaces and deflecting surfaces. Outlines 8-step program of planned fluorescent lighting maintenance, and discusses advantages of planned group replacement.—SYLVANIA ELECTRIC PRODUCTS, INC., 56 Boston St.

B-28 MAGNETIC TOOLS — Technical Bulletin No. M-30, 4 pages—Presents illustrations, specifications, and prices of sixteen standard, hand-operated permanent-magnet tools. Included are tools for handling, salvaging, sorting, separating, detecting, cleaning, extracting, loading, holding, inspecting, retrieving, protecting—for law of the property of the process of the

B-29 PROTECTIVE PLANTIC PAINT—
Bulletin No. 201, 8 pages—Describes characteristics, applications, and methods of use of corrosion resistant protective plastic paint for marine atmospheres, tropical climates, chemical attack, abrasive action, and similar conditions. Explains painting of metals, concrete, brick, stone, plaster and ashestos board in muturial use. —THE RIGHT CORPORATION, Chrysler Bide, Add Lesington Ave. New York 17.

B-30 PROTECTIVE MEMBRANES— Booklet, 14 pages—Prepared to assist maintenance men, engineers, architects and others faced with the responsibility of and others faced with the responsibility of providing equipment best suited to with-stand corrosion. Linings, rubber, and plastic are covered, including how, where, when and what to buy; corrosion resistance chart; and helpful guide on selecting right lining for specific problems.—HROADWAY RUM-BER CORP., Acme-Fisher Division, 528 E. Broadway, Louisville 2, Ky.

B-31 LEATHER BELTING-Catalog and

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B-33 METAL PAINTS Bulletin, 6 pages B-33 METAL PAINTS—Rulletin, 6 pages "The Application of Subox and Subalox Metal Paints" describes a simplified paint system for the prevention and control of rust including protection; types; application by thow coating, brush, or spray; painting of fences; drying time; thinning; and preparation of surfaces.—SUBOX, INC., Fairmount Plant, Hackenback, N. J.

B-34 STAINLESS STEEL COATING— fleations, uses and method of application of stainless steel liquid for brush or spray application to all metal surfaces for protection against heavy corrosion, to reduce depreciation of plant equipment and maintenance costs.—STEELCOTE MFG. CO., Gratiot at Theresa, St. Louis 3, Mo.

B-35 POWDER ACTUATED FAST-Illustrates and describes "Tru-Set" Tasteners, which are held straight in the barrels of powder actuated tools by an elasticized red tip that pilots the fasteners into the work. Tables int various sizes and types available. —RAMSET FASTENERS, INC. 12117 Herea Road, Cleveland 11, Ohio.

B-36 METALLIZING—Bulletin M 5000-8-48, 4 pages—Describes processes and uses: application and how metallizing can be used for making mechanical repairs; pro-tecting surfaces against corrosion. Outlines other industrial maintenance services— METALWELD, INC., 26th & Hunting Park Ave., Philadelphia 29, Pa.

B-37 PLANT LIGHTING MAINTE-Formulas, charts, and practical examples for use by non-technical personnel outline three practical plans to combat handlesps to productivity through planned cleaning programs fluorescent lane y non-technical personnel outline ctical plans to combat handicaps tivity through planned cleaning fluorescent lamp group replacement; and incandescent lamp group replace-ment.—CHAMPION LAMP WORKS, Lynn.

B-38 PREVENTIVE MAINTENANCE—
complete outline of the successful institution of preventive maintenance program for
any industry. Detailed consideration of
power equipment is given with chart for
scheduled work and cleaning. Covers turbines, generators, switchboards, motors,
controls, and other types of electrical apparatus.—WESTINGHOUSE ELECTRIC Pittsburgh ORPORATION, Box 2029.

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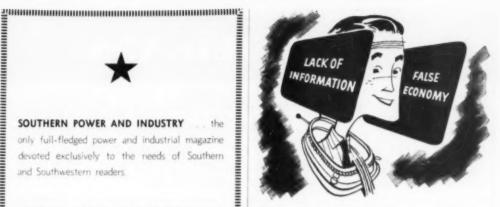
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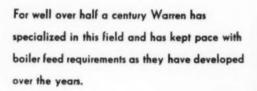
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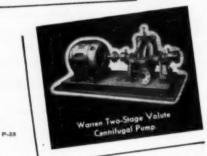
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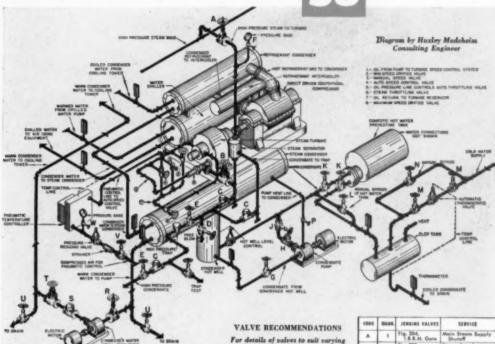


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| | C00E | QUAN. | JENEINS VALVES | SERVICE |
|----|------|-------|-----------------------------------|--------------------------------------|
| | A | 1 | Fig. 204, 1.8.8.M. Gote | Main Steem Supply Shutaff |
| | | 1 | Fig. 923, I.B.B.M. Globe | Steam Supply to Turbine |
| | C | 3 | Fig. 962, Br. Swing Check | Prevent Condensate Backflow |
| | D | 2 | Fig. 970, Br. Globe | Free Blow and Trap Test |
| | E | 2 | Fig. 280, Br. Gate | Trap Shuteff |
| | P | 1 | Fig. 703, Br. Needle | Nigh Pressure Steam Gage |
| | G | 1 | Fig. 370, Br. Gate | Condensate Pump Shutdown |
| | н | 1 | Fig. 92, Br. Swing Check | Prevent Condensate Backflow |
| | 1 | 1 | Fig. 106-A, Br. Globe | Condensate Pump Control & Shyleff |
| | K | 3 | Fig. 270, Rr. Gate | Prehost Water Tank Shutaffs |
| | £ | 1 | Fig. 106-A, Br. Globa | Prohest York By Poss |
| | M | 2 | Fig. 270, Br. Gate | Cold Water Shutoff Valves |
| | N | 1 | Fig. 106-A, Br. Globe | Manual By Pass |
| | | 3 | Fig. 741-G, Br. Needlo | Condensate Vest |
| | | 1 | Fig. 253, 1.B.B.M. Gate | Condensate Water Shuteff |
| | 3 | 1 | Fig. 33P, I.B.B.M. Swing Check | Condenser Water Pump |
| -[| Y | 1 | Fig. 162, 1.8.8.M. Globe | Condenser Water Flow Control |
| • | U | 2 | Fig. 106-A, Br. Globa | Drain Valvas |
| | ٧ | 1 | Fig. 106-A, Br. Globe | Prevent Air Supply Shutoff |
| | w | 1 | Fig. 741-G, Br. Noodle | Pressure Gage Control |

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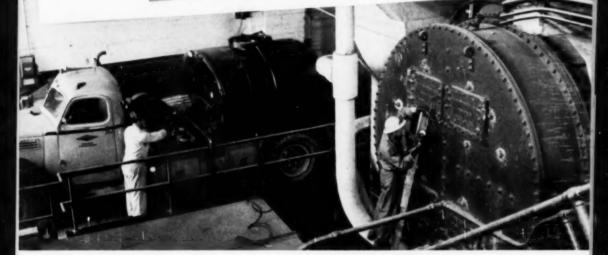
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